The implementation of videogames in healthcare:

The case of Nintendo Wii® in rehabilitation

by

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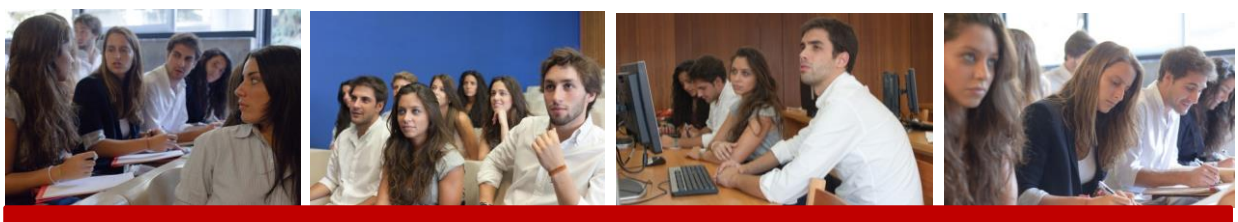

Biographical Note

Orlanda Filipa Jacinto e Simas was born on December 23th of 1992 in Vila Nova de Gaia.

She was raised in Faial Island since the age of one, where grow up and complete all her education until the high school. In the year of 2009 she accomplished the grade of 20 (in a 0/20 scale) in the National Exam of Economy A.

In September of 2010 she accepted in the Management bachelor in the School of Economics and Management of Porto, degree that was concluded in January of 2014. In the same year Orlanda accomplished two new goals: she was accepted in the Master in Economics and Management of Innovation, as well had her young entrepreneurship project (Balcão 202 –Competir + Empreende Jovem nº80) accredited.

Currently she is an intern in initial training in INESC Porto.

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Resumo

O objectivo desta dissertação foi responder à questão "Como é que se desenvolve o processo de implementação de videojogos numa organização de cuidados de saúde?".

Esta questão surgiu devido à recente crescente utilização deste tipo de terapias não convencionais aliada à importância que o processo de implementação tem para que uma inovação seja utilizada em todo o seu potencial.

Deste modo procedeu-se à elaboração de três estudos de caso em clínicas de reabilitação que utilizam a consola Nintendo Wii®, duas delas com características muito semelhantes em termos de estrutura organizacional, dimensão, localização, número de trabalhadores e práticas de reabilitação, e a outra bastante diferente, sendo localizada noutra área geográfica, tendo uma estrutura organizacional diferente, sendo de maior dimensão, tendo mais especialidades de reabilitação e um muito mais elevado número de trabalhadores. O objectivo com estes diferentes casos foi o de poder fazer comparações entre organizações semelhantes e uma organização diferente (que trouxesse riqueza ao estudo por garantir maior variedade na amostra), mas cuja atividade core fosse a semelhante.

Com este trabalho foi possível contribuir para a literatura sobre implementação de inovações na saúde (mais precisamente de videojogos em clínicas de reabilitação). Concluiu-se que a decisão de adoção parece ser informal quando o objeto de adoção é uma consola de jogos, a fase de pré-implementação em que os terapeutas se preparam para utilizar a consola nas suas práticas terapêuticas tem uma grande importância para o processo de implementação, a implementação de uma consola como a Nintendo Wii® ocorre segundo uma lógica de adaptação mútua entre a consola e os terapeutas, embora com fortes caraterísticas de implementação mecânica, e, ainda que a consola não ofereça as melhores condições para ser utilizada em todo o seu potencial, os esforços de

rotinização da sua utilização no dia-a-dia podem ajudar a ultrapassar a resistência à utilização que essa falta de condições cria.

Abstract

The main goal of this work was to answer the question "How are videogames implemented in healthcare organizations to be used as therapy instruments"

This question emerged in the intersection of the recent increasing interest in the use of this type of innovations in therapy, with the importance of the implementation process to be able to use an innovation in its full potential

Therefore, a multiple case study was performed, using three case studies of implementations of Nintendo Wii® console as a therapy instrument in rehabilitation clinics . Two of those cases have similar characteristics, similar organizational structure, size, location, number of workers and rehabilitation practices, while the other quite different, it is located in another geographical area, with a different organizational structure, with a bigger dimension, with other specialties of rehabilitation and much more workers. The objective was to compare the implementation in similar organizations and establish contrasts with a different one that has the same core activity.

This work makes some contributions to the literature of implementation of an innovation on a healthcare organization (more precisely of videogames in rehabilitation). It was possible to conclude that when adopting a console such as Nintendo Wii® with rehabilitation purposes, the adoption decision seems to be informal; the pre-implementation stage, when therapists conveniently prepare themselves to start using the console in their treatments, is quite important for the implementation process; the implementation of a console such as Nintendo Wii® occurs as a mutual adaptation process although with characteristics of a mechanical implementation; and, although the console may not provide the best conditions to be used in the rehabilitation context in its full potential, the efforts to routinize its use may help overcoming the resistance to use it due to that lack of conditions.

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1. Introduction

Videogames and health are frequently considered opposites, since typically videogames are highly associated with a sedentary lifestyle, obesity, socially undesirable behavior, epilepsy, addiction, among others (M. Griffiths, 2004). However, there have been more and more studies on the benefits of videogames in the most different fields (Agmon, Perry, Phelan, Demiris, & Nguyen, 2011; M. Griffiths, 2002, 2004; Jung, Li, Janissa, Gladys, & Lee, 2009; M. Williams, R. Soiza, A. Jenkinson, & A. Stewart, 2010).

Furthermore, videogames are associated to young people and children, but some studies had proven that those have the potential to improve the quality of live for elderly people (Agmon et al., 2011; Esculier, Vaudrin, Beriault, Gagnon, & Tremblay, 2012; Saposnik et al., 2010; M. Williams et al., 2010) and to prevent some problems that can lead to a loss of their independence, such as falls (Agmon et al., 2011; Jung et al., 2009; Toulotte, Toursel, & Olivier, 2012; M. Williams et al., 2010).

This led to an increase in the number of studies about the suitability of videogames for other purposes rather than entertainment, such as education (M. Griffiths, 2002), health (M. Griffiths, 2004), fitness (M. A. Williams, R. L. Soiza, A. M. Jenkinson, & A. Stewart, 2010), among others, and others that question the relevance of videogames on those same practices (Laver, Ratcliffe, George, Burgess, & Crotty, 2011).

Using videogames for these purposes leads to several questions: their suitability to treatment, their adaptation, their long-term results, among others. One of them, the subject of this work, is: how are videogames implemented in healthcare organizations to be used as therapy instruments?

There are several challenges in the implementation process: it is time consuming, it is resources consuming, it requires the creation of new knowledge, and it evolves in an ecosystem of interrelated actors. The implementation of innovation on the

healthcare industry has some particularities and the use of an unconventional treatment, such as one that uses videogames, can be very challenging.

One of the most studied videogames is Nintendo Wii®, the console of Nintendo, and its games, particularly Wii Fit®.

In this work it was conducted a multiple case study about the implementation of the console Nintendo Wii® in rehabilitation organizations to be used as a therapy instrument, with the intent of providing a preliminary answer to the previous research question and provide directions for future research.

This dissertation is divided in seven sections. After this brief introduction, it continues with a theoretical background, a section explaining the methodology used, a results section presenting the results retrieved per case study, a discussion section and a final section with some conclusions that draw directions for future research.

2. Theoretical Background

2.1 Videogames Industry

Despite being relatively recent, the videogames industry represents a significant and continuously growing share of media and entertainment market (table 1) (Prato, Feijóo, D. Nepelski, M. Bogdanowicz, & Simon, 2010). In 2009 it was estimated that the market value of videogames industry represented around €45-50 billion ($50-60 billion), but it is observable that the values were underestimated (Prato et al., 2010).

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Total Videogames	43,460	51,390	55,089	58,383	61,604	67,026	73,513
Total Media & Entertainment	1,373,941	1,408,950	1,354,068	1,359,495	1,411,788	1,506,409	1,613,173
Share of videogames in media & entertainment market	3,16%	3,65%	4,07%	4,29%	4,36%	4,45%	4,56%

Table 1: Global Videogames Market Value, Global Media & Entertainment Market Value and Share of videogames in media & entertainment market value (2007-2013, million US$). Adapted from: Born Digital / Grown Digital: Assessing The Future Competitiveness of The EU Video Games Software Industry

The share of videogames industry in media and entertainment market has been increasing every year and the trend is continuing. “The past two decades have seen the mass production and distribution for retail sale of video games for use on personal computers, advanced games consoles, including portable devices, and mobile phones. In today’s industry, game developers and publishers work together to make available a wide range of games” (Prato et al., 2010, p.2).

"The video games software industry appears to be one of the most innovative labs for the coming Digital Economy and this aspect may be even more important than its size and its growth rate" (Prato et al., 2010, p.2).

2.2Videogames and health

Usually videogames are not associated with positive effects on gamers. Quite the opposite, videogames are often associated with a sedentary lifestyle, obesity, violent behavior, unwanted social behavior, epilepsy, addiction, among other problems (M. Griffiths, 2004). Several studies concern the abusive use of videogames, with a particular focus on violent videogames, but only a few concerned their moderate play. Moreover, there is little evidence of serious acute adverse effects on health from moderate play (M. Griffiths, 2004). Griffiths published some articles on the intensive use of videogames (mainly focused on addiction and behavioral changes) (M. Griffiths, 1999; M. Griffiths & Wood, 2000; M. D. Griffiths & Meredith, 2009), but he does consider the benefits of moderate use as well (M. Griffiths, 2002, 2004).

Literature divides videogames in three types: *serious games*, which are designed for other purposes than entertainment, such as education and health (Prato et al., 2010; Susi, Johannesson, & Backlund, 2007); *core games*, which are the traditional type of videogames that are built for entertainment and include computer games, console games, handled devices games, etc. (Arin, Kuipers, & Vermeulen, 2003; Prato et al., 2010); and *casual games*, which are those played occasionally to spend some time, such as playing a game in a smartphone while sitting in a waiting line, and that usually have simpler game controls and are less complex games (Kuittinen, Kultima, Niemelä, & Paavilainen, 2007; Prato et al., 2010).

Serious games and *core games* can be used to bring some health benefits. The *core games*, which would be the less obvious to have health benefits, have a strong potential as pain distractors. If used correctly this kind of distractor can reduce expenditures on painkillers, as well as the side effects of using them (M. Griffiths, 2004).

"One of the most interesting innovations has been the use of videogames as distractors in the role of pain management. Studies have shown that

cognitive/attentional distraction may block the perception of pain. The reasoning is that distractor tasks consume some degree of the attentional capacity that would otherwise be devoted to pain perception." (M. Griffiths, 2004, p.340)

Serious games play an important role in healthcare for a few years. All three big companies of videogame industry (Microsoft, Nintendo and Sony) provide *serious games* for their consoles, but the most prominent company in that field is Nintendo.

Nintendo stands out by its recent consoles that force users to move and make some exercise. Therapists are now using those consoles as a way of treatment for several types of injuries.

In 1995 the console Super Nintendo Entertainment System® already had a *serious game* developed by WaveQuest and published by Raya Systems called *Packy & Marlon*®. In this game two diabetic elephants participate in a summer camp and are assigned to save it from a rats invasion while controlling their diabetes. "The risk of developing diabetes is higher than any other severe chronic disease of childhood" (Brown et al., 1997, p.77). Diabetes have short term effects, but also long term complications, such as blindness or kidney failure (Brown et al., 1997). Therefore, a good health self-care education for young people with diabetes is essential.

Packy & Marlon® was the subject of research with young people (ages between 8 and 16) that led to conclude "that well-design, educational video games can be effective interventions" (Brown et al., 1997, p.77), since the episodes of acute care related to diabetes dropped over 70% in the group (Brown et al., 1997). *Packy&Marlon*® was the first from a series of educational videogames that also included *Rex Ronan: Experimental Surgeon*® (smoking prevention), *Captain Novolin*® (diabetes) and *Bronkie the Bronchiasaurus*® (asthma).

Nintendo 3DS® (a handled game console from Nintendo) has been studied about its role in the diagnose of vision depth related problems (Tidbury, Black, & O'Connor, 2015), but it has not have, up until now, the same prominence that other Nintendo

consoles or games have had in the past.

Nintendo Wii®, the first console that forces users to move and make some exercise, has been recently studied as a therapeutic instrument, concluding that it provides videogames with benefits for health, particularly in geriatric and rehabilitation specialties of care (Agmon et al., 2011; Esculier et al., 2012; Laver et al., 2011; M. Williams et al., 2010).

Numerous authors consider that Nintendo Wii® is a promising complement to the conventional therapy methods in cases such as stroke rehabilitation (Burke et al., 2009; Saposnik et al., 2010), physiotherapy (Agmon et al., 2011) or even as a balance training for people with Parkinson's disease (Esculier et al., 2012).

There are several studies about the usability of Nintendo Wii® in geriatric field. Laver et al. (2011) study whether it is acceptable to use videogames for elderly care, concluding that "the usefulness of the Wii Fit® as therapy tool with hospitalized older people is limited" (Laver et al., 2011, p.1). Furthermore, they conclude that most of elderly people prefer the traditional approach of therapy and that the percentage of people that are able to use it is small. The problems outlined by Laver et al. (2011) after their controlled study were the lack of independency and social interaction that videogames create, and the difficulties with working with Nintendo Wii® system (such as, starting the system and choosing the game). These authors even suggest that one of the previous studies about the Nintendo Wii® for prevention of falls was not a rigorous since the recruitment was achieved via press release (EXercising with Computers in Later Life (EXCELL) - pilot and feasibility study of the acceptability of the Nintendo Wii Fit® in community-dwelling fallers, by M. Williams et al. (2010)).

On the other hand, other controlled studies about the Nintendo Wii®'s usability by the elderly conclude that it can bring health benefits for elderly (Agmon et al., 2011; M. Williams et al., 2010). The studies have very different criteria in the selection of their study participants, although in all those studies, every elderly an episode of fall

(Agmon et al., 2011; Jung et al., 2009; Toulotte et al., 2012; M. Williams et al., 2010). "Falls are prevalent in older persons, and the incidence of fall increases with age" (Dunn, Rudberg, Furner, & Cassel, 1992, p.395). This is a big concern because falls could lead to death in the moment or in the long term due the injuries that result from the fall (Dunn et al., 1992). "Several studies show the relationship between falling and mobility disorders, diseases, sensory losses, medication use, and limitations in activities of daily living" (Dunn et al., 1992, p.395). It is therefore explained the main reason why Nintendo Wii® is so studied in the geriatric field, because of the potential to be used as a therapy tool by elderly people to improve their physical condition and in that way prevent falls and further problems. Some studies show that training with the videogame Nintendo Wii Fit® (which includes a balance board) improves elderly's Berg Balance Scores and the Walking Speed (Agmon et al., 2011; Toulotte et al., 2012), which are physical conditions that are essential to prevent the falls.

The majority of the studies emphasize in their conclusions that there is a need for more studies in this field. Most of the research analyses Nintendo Wii® as a home therapy, which increases the difficulty of its use, since generally elderly have more difficulties understanding how new technologies work. It would be interesting to have more studies that could verify if it is expected that such difficulties would be overcome if Nintendo Wii® would be used as a therapy instrument in rehabilitation clinics (where elderly have support while using the console). Research focused on such use would enlarge current knowledge about the benefits of Nintendo Wii® for healthcare, namely as a complement for therapy. Furthermore, it would be important to discuss how appropriate, efficient, useful and desirable it is to use Nintendo Wii® as a complement to therapy, as it is already being used by some clinics.

However, the process of adoption of a Nintendo Wii® is not merely to buy it and place it somewhere in the clinic, and it is ready to be used in its full potential. As for many other technologies, Nintendo Wii® needs to be carefully implemented in the clinic to become part of its routines (Edmondson, Bohmer, & Pisano, 2001; Leonard-Barton,

1988b; Rogers, 2002). The next section will examine the literature about the adoption and implementation process of new technologies, which is the focus of this research.

2.3. Innovation Implementation

2.3.1. What is "Implementation"?

In the literature one can find different definitions for implementation that reflect different and complementary perspectives over that same process. Linton (2002) defines implementation as one of the final steps of the innovation process. Klein and Sorra (1996) define it as a process with the purpose of promoting the use of an innovation in some targeted members of an organization. Similarly, Greenhalgh et al. (2004) define it as the efforts to mainstream an innovation in an organization. Conjugating those definitions the implementation will be defined as a process that begins when an innovation is adopted by the organization and ends when it is completely routinized or is abandoned (Linton, 2002). But the adoption does not ensure its implementation (Klein & Sorra, 1996). To fully obtain the economic and competitive advantages that the innovation can offer it is fundamental that the implementation process succeeds (Linton, 2002).

The process of implementation of an innovation in an organization is not always easy (Klein & Knight, 2005; Klein & Sorra, 1996). Rather, it is often very difficult (since it requires more effort than the usually dispended (Klein & Sorra, 1996)) and has a high failure rate (Linton, 2002). Therefore, the implementation process becomes a concern for managers since the benefits of innovation will not be retained if the implementation process fails (Leonard-Barton, 1988b; Linton, 2002). For that reason, sometimes it involves a series of controlled experiments, such as the experiments of Toyota when implementing the Just-in-Time production method (Choi & Moon, 2013).

However, it is frequent to not spend the appropriate amount of time and attention in the implementation process. The implementation is often seen as some kind of mechanical or automatic process, which underestimates the possibility of emerge new opportunities during the process. The benefits of innovation are correlated as much

on *how* innovation is implemented as on *whether* it is implemented, which is why the line of view that treats the implementation process as automatic does not always succeed (Choi & Moon, 2013).

Implementation failure occurs when, despite the decision of adopting it, the targeted user uses the innovation with a frequency, consistency and regularity below the necessary for the innovation be used in its full potential. Still, this failure can reflect a flaw in implementation or a shortcoming in the innovation itself (Klein & Sorra, 1996).

Klein and Knight (2005) present a list of six barriers to innovation:

1. Many innovations are imperfect, being something new it is usual to have bugs, break downs and be difficult to use
2. The users are not the ones who decide to adopt the innovation. That decision is typically done by those who are higher in the hierarchy.
3. It is required that the users of innovation acquire new technical knowledge and skills.
4. "(…), many team and organizational innovations require individuals to change their roles, routines, and norms." (Klein & Knight, 2005, p.244)
5. Implementation as not being something automatic is time consuming, expensive and, in a first phase, the innovation may decrease the performance of the activity.
6. Psychological motives: the users may be able to acknowledge the benefits of innovations, but they are used with the previous method so they will resist to the adoption of the innovation.

In the same work, Klein and Knight (2005) present another list with six system antecedents that are considered key factors that shape the process and outcomes of innovation implementation. It is referred that none of this factors per se is absolutely critical for a successful innovation implementation process:

1. The package of implementation policies and practices that an organization establishes that will prepare the employees to use the innovation. It could include several things like training available to the users, which can vary in quantity and quality, technical assistance, rewards to innovation use, and the user-friendliness of the innovation itself. None of those policies and practices seems to be critical to the implementation, but the quality them all is predictive of a quality implementation.
2. Team's or organization climate for an implementation process of an innovation. The perception of the innovation by the team or the organization will influence the importance given by the employees to the innovation more than in organizations or teams that do not have the same organizational climate.
3. Manager's support of an innovation, since they have a critical role in the implementation process. Managers should demonstrate a strong, informed, convincing and demonstrable support to the implementation, otherwise the innovation can be seen as a "management fancy" by the employees, which will difficult the implementation process.
4. Financial resources. "Implementation is, of course, not cheap"(Klein & Knight, 2005, p. 244) since it needs to be offered extensive training to the users and have available user support, could be necessary to dispend funds in a communication campaign that explain the benefits of the innovation, and the organization has to be prepared to lower its performance standards while the employees learn how to use the innovation.
5. Learning Orientation: practices that promote skills development, learning and growth by the employees and the organization. If failure is seen as part of the learning process the implementation will be eased, since the user will not feel constrained by the innovation.

6. Managerial Patient or Long Term Orientation. As it was referred in the financial resources point, the organization has to be prepared to see its performance decrease while the employees learn how to use the innovation. The degree of long-term orientation and patient from management will shape the innovation implementation.

Several factors may lead to implementation failure, some of which are related with how people react to the change brought by the innovation to the organization. When an innovation is implemented sometimes the targeted users are not prepared for it, not due to lack of knowledge, capacity or resources, but due to lack of motivation, influenced by system antecedents (contexts for innovation that differ between organizations, with some structural and some cultural features that have been shown to influence the innovation assimilation) or the impact that the innovation might have in their activities.

Literature often divides the adopters or the users in "laggards" (the ones who take more time to adopt the innovation) and "early adopters". For instance, Rogers (2002) classifies the members of the organizational system (users) in five categories: "innovators", "early adopters", "early majority", "late majority" and "laggards". "This categorization is based on the percentage of individuals (or organizations) under each portion of the normal curve, marked off by standard deviations from the mean" (Rogers, 2002, p. 990).

However, such categorization is a stereotype that "fails to acknowledge the adopter as an actor who interacts purposefully and creatively with a complex innovation" (Greenhalgh et al., 2004, p.598). Greenhalgh et al. (2004) propose seven characteristics of adopters and the adoption process that help capture the adopter as an actor who interacts with the innovation:

- General psychological antecedents –it refers to the individual traits that are related to the propensity to try out and use innovation;

- Context-specific psychological antecedents –it refers to the motivation and capability ("in terms of values, goals, specific skills, and so on" (Greenhalgh et al., 2004, p. 599)) to use a particular innovation and its positive relation with the probability of the user adopt it;
- Meaning –the meaning has a great importance on the adoption decision, since the more in line the members of the organization are, more likely will be the assimilation. "If the meaning attached to the innovation by individual adopters matches the meaning attached by top management, service users, and other stakeholders, the innovation is more likely to be assimilated" (Greenhalgh et al., 2004, p. 599);
- The adoption decision by an individual -rarely is independent from other individuals. This decision can be:
    - Contingent –it is dependent from a decision made by someone else;
    - Collective –de decision is taken by a group within the organization, the user can express himself/herself, but ultimately is the decision of the group that counts;

  It is presented also a model called Concerns Based Adoption Model that is lesser-known and that provide three components for Greenhalg et al.'s model:

    - Concerns in preadoption stage –it refers to the prerequisites that need to be fulfilled for the adoption:
        - Awareness of the innovation
        - Information about the innovation
        - Personal effects of the innovation in its users
    - Concerns during early use –it is related to the information and support that the users have continually during their first experiences with the innovation;

- Concerns in established users –it states that the adoption will be more likely if the users get the proper feedback, at the same time that the users have opportunity, autonomy and support to adapt the innovation to their needs.

Moreover, innovations threaten to disrupt organizational routines when their use involves interdependent users (Edmondson et al., 2001, p.5), which means that users need to interact (communicate or work together) in order to create new routines. In most of those cases an adaptation process is necessary, since it is atypical that the innovation fits the user environment perfectly. Therefore, it is common that the implementation of the innovation requires changes in the innovation and in the adopter (Leonard-Barton, 1988a).

2.3.2. Methods of Implementation

According to Choi and Moon (2013) there are four different methods of implementation: Mechanical Implementation, Learning, Reinvention and Mutual Adaptation.

Mechanical Implementation involves implementing the innovation without many changes in its original design and in the way its users perform their work.

Learning comprises adapting users to become more skillful to use the innovation, which could mean change their values, skills and work behavior depending of the requirements of the innovation. The innovation itself is not changed, but the users go through significant efforts changing the way they work.

Reinvention is the adaptation and modification of innovation by the users and the suppliers so it can fit better to their work activities.

Learning and Reinvention individually are methods of implementation, but when they are seen in a context together it is possible to say that it is a case that the method of implementation is Mutual Adaptation, and Learning and Reinvention are factors that are part of the same implementation process.

In mutual adaptation, as the name suggest, both the innovation and the users need to change in order to adapt to one another. In this process there is a number of interactive processes of change of those two actors leading to the conditions for adequate use of the innovation in the organization, taking full advantage of that use.

Leonard-Barton (1988a) refers to the changes in the innovation and in the adopter as “cycles of adaptation”. Such cycles can vary in magnitude, i.e., adaptations in the innovation and in the adopter can have different degrees of impact: they can be proportional (significant changes or small changes in both sides) or be bigger in one side than the other. According to the same author the adaptation should be neutral, since some other authors consider it undesirable and others consider that is mandatorily

positive, it is defended in this work that mutual adaptations can take either beneficial or detrimental forms and that is the management of the implementation process that will make the difference.

2.3.3. Implementation Stages

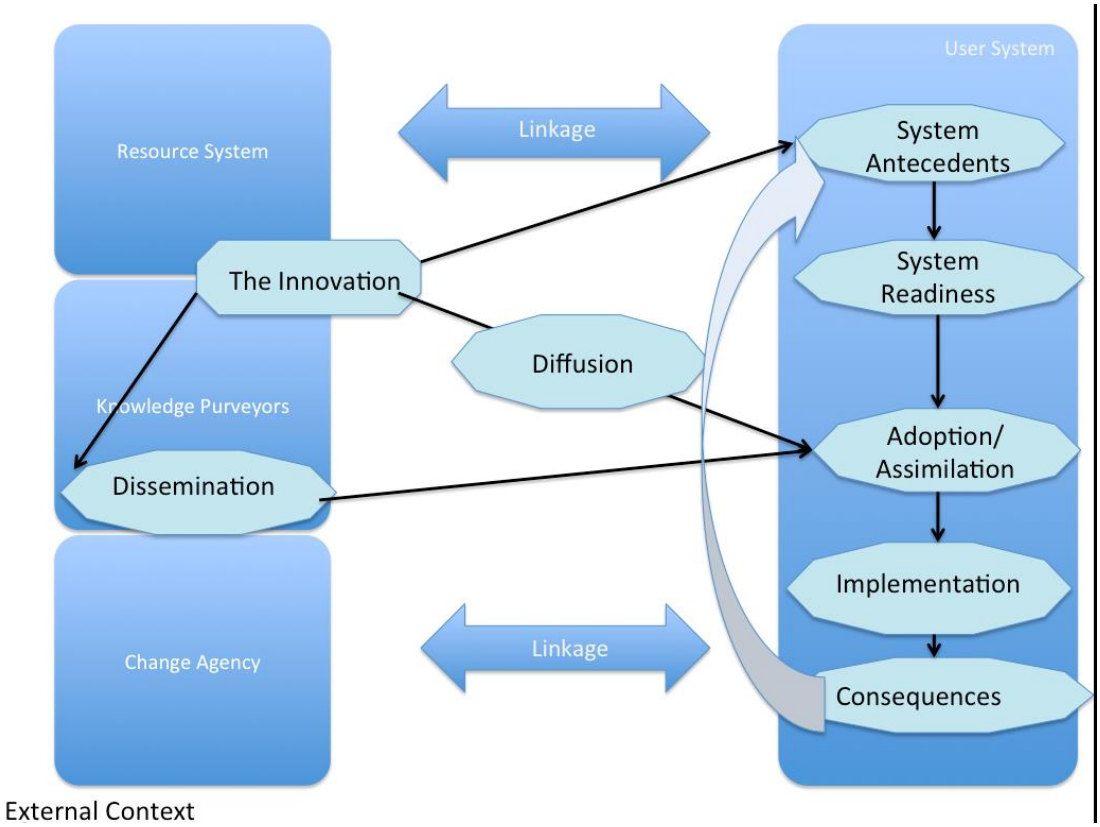

Figure 1 -Conceptual Model for Considering the Determinants of Diffusion, Dissemination, and Implementation of Innovations in Health Service Delivery and Organization, Adapted from (Greenhalgh et al., 2004)

In Figure 1 it is possible to observe that the implementation process is a complex system composed by a set of sub-processes. In short, there is a user system with some degree of readiness to use and accept the innovation. After processes of dissemination (process of formal and planned communication and influence) and diffusion (process of informal and unplanned communication and influence), the innovation is acknowledged by the users that then decide whether to adopt/assimilate it. When deciding to adopt the innovation, users will begin an implementation process, which could have different

outcomes: incorporation or routinization, if the process is successful, or failure otherwise.

According to Linton (2002) there are three measures of implementation success: Routinization, Incorporation and Time Required to Implement. Linton (2002) argues that those measures can be widely used as success measures, while other measures that could also be used like: goal attainment (when the innovation meets the expectations), payback (it is a measure of returns of an investment) and management satisfaction (quantifies the degree to which the management of an organization considers an innovation to be a success) have limitations and its use should be cautious. Those limitations are:

- Goal attainment –goals change during the implementation period;
- Payback –prior calculations of Payback are unreliable and are rarely done after the implementation;
- Management Satisfaction –it is able to capture qualitative and quantitative performance, but at the same time the word "satisfaction" is value-laden.

Routinization represents the end of the process and that the performance of the implemented innovation is acceptable and it is one of the desirable outcomes of the implementation process (Greenhalgh et al., 2004; Linton, 2002).

Incorporation is defined as a measure of how much an innovation is being used in its full potential. It is possible that an organization may be satisfied with the performance of an innovation, but not reaching the full potential of it, so its level of performance should not be seen as an optimal result (Greenhalgh et al., 2004; Linton, 2002).

Time Required to Implement as the name say is the time that is required to completely implement an innovation in an organization and it is a measure of the efficiency of the implementation process (Linton, 2002).

Davis (1989) in their Technology Acceptance Model provide instruments to assess the acceptance of users. They argue that information technologies (IT) offer potential to improve the performance of users in particular activities, but that improvement is constrained by the capability of users to use the available systems. In this scenario, users' acceptance of IT is important to motivate them to use the innovation. Two key concepts that frame users' acceptance are distinguished "Perceived Usefulness" and "Perceived Ease of Use".

Perceived Usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). People tend to decide to use an innovation if they believe that it will help them to improve their work.

Perceived Ease of Use is "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). Even if the potential users perceive a high usefulness of a innovation, if they perceive it at the same time as something that is difficult to use and that the benefits of its use does not compensate the effort of learning how to use it, what will make the more resistant to change. "All else being equal, (…), an application perceived to be easier to use than another is more likely to be accepted by users" (Davis, 1989, p. 320).

2.3.4. Implementation Process

According to Choi and Moon (2013) individual attributes (the individual characteristics of each actor of the implementation process that will be influenced by the innovation) of the organizational members, the innovation, and the social context surrounding the interaction between the innovation and the members of the organization have a great impact on the innovation implementation. Leonard-Barton (1988a) argues that during the implementation of an innovation adaptations are needed in the user environment (which includes what Choi and Moon (2013) call members of the organization and social context) and in the technology (the innovation), because there will be misalignments between both that have to be overcome in order for the implementation to be successful.

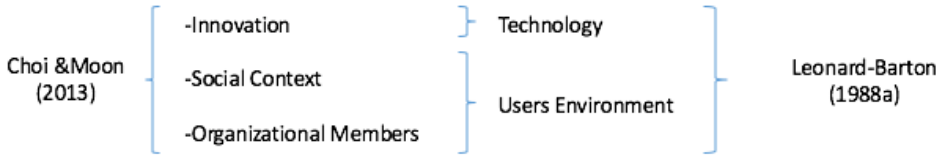

Figure 2: The relationship between actors of the implementation process of Choi&Moon (2013) and the actors of the implementation process of Leonard-Barton(1988a)

Linton (2002), on the other hand, considers that success factors of an implementation could be organized in five categories: Organizational Structure; Technology; Project Management; Divisibility; and Social Interactions.

Organizational Structure include factors such as size, structure and culture (of the organization), which are the organizational characteristics that Damanpour (1991) considers that favor a successful implementation.

The technology category considers factors such as complexity of the innovation, previous knowledge about the innovation and "absorptive capacity". The less complex the innovation and the more quantity and quality of the previous knowledge about it, the easier will be implementing the innovation. The "absorptive capacity" relates the degree of complexity of an innovation, being this dependent of the previous knowledge about it. The more quantity and quality of the previous knowledge about the innovation, the less complex it will seems to their users, and so easier to implement.

Project Management includes "determining needs and objectives, dividing work into stages, determining the manpower required, budgeting, assigning milestones, evaluating progress, exercising project control, and applying project monitoring system" (Linton, 2002, p.69). In this category other authors suggest further factors (Holland, 1999; Pinto & Slevin, 1989) that could be seen as critical to the success of Project Management, and therefore the implementation project, such as :

- Project mission -goals and general directions, the project's objective;
- Top management support –in terms of resources and power/authority;
- Project schedule/plans –detailed schedule and plans about every step;
- Client consultation –communication with the client;
- Personnel –the employees. It refers too to the recruitment, selection and training of the individuals that will integrate the project team;
- Technical tasks –availability of the innovation and knowledge required to accomplish the project's goals;
- Client acceptance – "the act of "selling" the final project to its ultimate intended users (Pinto & Slevin, 1989, p. 31);
- Monitoring and Feedback –control and providing of information related with the different stages of the implementation process;
- Communication –facilitation of the required network and data to all key actors in the project implementation;
- Trouble-Shooting –the necessity of be capable to deal with possible

crises and problems that can emerge.

Divisibility refers to the possibility of dividing the innovation in small parts to ease the implementation. Divisibility allows a small-scale implementation and thus limits possible adverse effects of an implementation failure. It is also called "modularity": A product or a process that is modularized is something that can be divided in parts and distributed by modules according to its design plan. Modules are distinct parts of a bigger system (Baldwin & Clark, 2006). Baldwin and Clark (2006) present three type of Modularity: Modularity-in-design (related to the design), Modularity-in-production (related to the production), and Modularity-in-use (related with the utilization). They argue that this concept of modularity makes possible the creation of value and its dispersion by so many firms. "(…) Modularity provides the kind of flexibility that enables firms to serve a variety of customer needs" (Doran, de Blok, Luijkx, Meijboom, & Schols, 2010, p.76). This modularity allows choosing the modules of the innovation that need to be improved or adapted, which will facilitate the implementation.

Concerning social interactions category, Linton (2002) refers that the general literature include: technology championing (technology champion is a manager that provides acceptance of the project and all the resources that are needed to develop it), communication (described before), training (described before), multidisciplinary teams/ user involvements and interactions with consultants and suppliers (described before).

Some of the success factors that are include in the categories of Linton (2002) are also identified by Greenhalgh et al. (2004), while others are not considered.

According to Greenhalgh et al. (2004) it is possible to consider that some features of the innovation could be critical success factors for the implementation process. Those features are relative advantage, compatibility, complexity, trialability, observability, reinvention, fuzzy boundaries, risk, task issues, knowledge required to use it and augmentation/support.

A lot of innovations are complex and difficult to use. Besides some of them have a high initial investment. Thus the implementation process and assimilation are eased when it is possible to try the innovation on a limited basis (Trialability) before fully implement it. Triability facilitates the adoption and assimilation (since it reduces the risks, fears and provides the opportunity to work with the innovation), and if the benefits of the innovation are made visible during the trial then it is easier to proceed with the rest of the implementation (Greenhalgh et al., 2004; Rogers, 2002).

Rogers (2002) and Greenhalgh et al. (2004) define observability as the degree of perception of the results of the innovation by the adopters. Such visibility of results motivates the users for the implementation. This is compatible with the vision of Davis (1989) of "Perceived Usefulness".

Task Issues refer to the results that are derived from the innovation utilization in the users performance. For that motive will influence the implementation as in the more the innovation is perceived as something that will improve the user performance in the intended task, which will facilitate the implementation (Greenhalgh et al., 2004).

When the innovation being implemented is perceived by the users with an advantage in face of the previous or of other concurrent solutions (relative advantage), then it will be easier to adopt and implement it. Rogers (2002) defines relative advantage as the degree of perception about whether an idea is better than the former one. If it is actually better or not it does not matter, what is relevant is how the innovation is perceived.

There are other features of the innovation that influence the implementation process, such as compatibility of the innovation with the intended adopters' values, norms, and perceived needs, and knowledge required to use the innovation, which might be codified or tacit knowledge. An innovation based on codified knowledge is easier to transfer from one context to another, since it is a knowledge that is transmissible by records (books, articles, manuals, etc.), and therefore it will be more likely to be

adopted than an innovation based on tacit knowledge (Greenhalgh et al., 2004; Rogers, 2002).

Reinvention as defined by Greenhalgh et al. (2004) is the possibility of adaptation of the innovation to the user's needs. Concerning reinvention, Rogers (2002) states says that innovation is not something that is invariant during its diffusion process and refers that in previous times this kind of adaptation was not taken in consideration.

Fuzzy Boundaries relate to complex innovations in service organizations, which can be conceptualized as having a "hard core" and a "soft periphery". The former is defined as the elements of the innovation itself that are impossible to reduce more, and the latter refers to the organizational structures and systems that are required to be possible to fully implement. The adaptiveness of the "soft periphery" is a key attribute of the innovation, since it represents the capability of the organization and the innovation to fit each other (their compatibility) (Greenhalgh et al., 2004).

Complexity is described by Greenhalgh et al. (2004) and Rogers (2002) as the key users perceived degree of difficulty to use an innovation. The less complex an innovation is perceived the easier it is to implement (Greenhalgh et al., 2004). It is possible to relate here the concept of "Perceived Ease of Use" from Davis (1989).

Risk is the high degree of uncertain, and the higher it is more difficult is to implement an innovation. For the organization how much more the balance between the risks and the benefits of the innovation, more easily this will be adopted. The risk is not only related with the organization, if the users perceive the innovation as "personally risky" they will resist more to the adoption.

A good support/augmentation (an "augmented product" can be considered a product with some added client value that the suppliers provide via services), like training, helpdesk, customization, etc., will facilitate the assimilation process and can decrease the impact of an innovation being more complex or tacit knowledge based. Linton (2002, p.71) refers that "Supplier involvement also reduces employees'

perception of risk, thereby reducing change resistance", which reinforces the importance of the suppliers support and augmentation.

2.3.5. Implementation on Healthcare Industry

The healthcare industry is one of the sectors with a major increase of expenditure in most countries. It is widely recognized that there is a need for reducing the costs and increasing the productivity of healthcare providers (Helfert, 2009).

Greenhalgh et al. define innovation in service delivery of healthcare organizations as

"*a novel set of behaviors, routines, and ways of working that are directed at improving health outcomes, administrative efficiency, cost effectiveness, or users' experience and that are implemented by planned and coordinated actions.*"

Greenhalgh et al. (2004 p.582)

This means that one of the possible solutions for reducing costs and increasing productivity in healthcare might be by innovating its service delivery. However, such innovation requires changing the healthcare delivery system. Changing organizational routines is hard, but in healthcare the barriers to change make it an enormous challenge (Sanders, Ong, Sowden, & Foster, 2014).

One could solely think that these difficulties exist because healthcare industry deals with people lives and well-being, but in many cases the innovation is not directly related with the treatment, which is the case of some software solutions, such as Electronic Health Records (EHR), so the problem is not only patients lives and well-being. In the case of EHRs, the problem may be, as it is usually for software, that its gains are not visible in a short term. To overcome that possibility, some organizations that purchase care, such as healthcare insurance companies and holdings that own healthcare organizations, provide means to support the costs of adopting EHRs and some financial benefits for those who adopt EHRs. However, even with such incentives the adoption of EHRs seems to be slow, which leads to the conclusion that there are other reasons influencing that decision. Some of those reasons are that many EHRs are

difficult to understand, namely how they will suit the needs of healthcare professionals and how their providers will deliver the required technical support (which, as referred previously, is an important factor for the success of an implementation) (Gans, Kralewski, Hammons, & Dowd, 2005).

Gans et al. (2005) believe that it is expected that the implementation of an EHR brings some clinical and economic benefits, but that, at the same time, those systems bring a great deal of uncertainty to the organization and professionals practices, which, makes the implementation more difficult.

It is then possible to conclude that there are several different barriers to change while implementing an innovation in the healthcare industry. At the same time it is important to note that the expression "barriers to change" has been used as a general term to express the difficulties in introducing innovations (Sanders et al., 2014).

The role of healthcare professionals is extremely important for this process of introducing an innovation in the healthcare industry (called "transition work"), since those "barriers" may be "integral to existing clinical work" (Sanders et al., 2014, p. 97), and the engagement of those professionals in the implementation can help clarifying whether the removal of such barriers may be desirable or counterintuitive. However, for an active participation of the healthcare professionals in the implementation, they have to be convinced of the usefulness of the innovation (Klein & Knight, 2005; Linton, 2002; Pinto & Slevin, 1989).

Kimberly and Evanisko (1981) present two different types of innovations that can emerge in a healthcare facility: technology innovations (those that are related to the diagnostic and treatment) and administrative innovations (less related to the core work from a healthcare organization and more related with its management). Those authors also argue that, for both types of innovation, organizational-level variables are better predictors of whether an innovation will be implemented or not, than individual or context variables.

On the other hand, Edmondson et al. (2001) consider that the use of only organizational-level lens does not influence overcoming powerful barriers to the implementation, as existing routines and status relationships inside the healthcare organization context. These authors consider that the success of the implementation process results from the collective learning within the healthcare organization. Their purpose was to find how teams and their leaders implement new routines, and how that implementation of new routines influence the implementation of the innovations that create those new routines, when the innovation has users that are interdependent.

Concluding, in healthcare sector the innovation is a driver of change, which enables reducing costs and increasing productivity. However, there are several barriers to change that complicate innovation implementation, some of which are the same as those observed in other sectors, and others are specific for healthcare industry, such as the pressure of dealing with patients lives / health and the reduced time of professionals to accommodate new routines in their daily activities.

In this research the implementation process of an innovation in healthcare contexts is studied. The innovation implemented is Nintendo Wii® and the healthcare contexts that implement its rehabilitation clinics.

3. Methodology

Some videogames have been adopted in the healthcare industry with a therapeutic purpose (Agmon et al., 2011; Jung et al., 2009; Saposnik et al., 2010; Theng, Teo, & Truc, 2010; Toulotte et al., 2012; M. A. Williams et al., 2010). This adoption requires a careful implementation process, to the extent that the generality of Portuguese schools of the diverse fields of healthcare do not prepare future healthcare professionals to deal with this kind of unconventional treatments.

The console that was studied on the following case studies was the Nintendo Wii®. Nintendo launched this console in 2006 and, as it is played using the movement of the player, it has been the subject of interest in rehabilitation research and its appropriateness as a therapy tool in recent years. The adoption of Nintendo Wii® as a therapeutic instrument requires the use of a set of technologies: the console itself, the game or software that will be run on it, a television screen (or another device with the ability to transmit image), wireless remote controls, Nintendo Balance Board®, and reception of wireless devices sensor. It requires that the patient has enough vision accuracy to observe the images transmitted, ability to hold the remote control, ability to go up and down the balance board, and ability to understand the flow of the game and to follow instructions (Laver et al., 2011). The use of this console can, to some extent, be tailored to specific patients.

Case studies were performed to observe the process of implementation of Nintendo Wii® in physiotherapy clinics and rehabilitation centers. The objective was to learn about the process of adaptation, the acceptance and adaptation of therapists to the console, the results, such as the acceptance of patients and other interested, among other possible relevant issues.

With the intent of facilitating the comprehension of this work, a distinction between Physiotherapy and Occupational Therapy is carried out next and specificities of each of those occupations are highlighted. According to the Chartered Society of

Physiotherapy from the United Kingdom "Physiotherapy helps restore movement and function when someone is affected by injury, illness or disability", while, according to The American Occupational Therapy Association, Occupational Therapy "help people across the lifespan in the things they want and need to do through the therapeutic use of everyday activities (occupations)". In another words physiotherapists treat injuries or illnesses while occupational therapists prepare the patient to certain (daily) activities.

Three case studies were performed: two concerning small physiotherapy clinics and one concerning a public rehabilitation center with a private management.

The two physiotherapy clinics are situated in two different Azores's islands, the clinic Click Saúde e Bem Estar (Click) is located in Faial island and Physio(e)motion Saúde e Bem Estar (Physioemotion) is located in Pico island. Both use Nintendo Wii® as a therapy instrument.

The rehabilitation center studied is Centro de Reabilitação do Norte (CRN). It is located in the North of Portugal, more precisely in Valadares, nearby Porto. It started its activity in the end of 2013 under the management of Santa Casa da Misericórdia (a private charity and social assistance institution, with philanthropic and public service purposes). At CRN, occupational therapists use Nintendo Wii® as a therapy instrument.

Using this sampling strategy it was possible to replicate utilization conditions between Physioemotion and Click in order to compare those similar scenarios (similar size, same activity, both located in islands, similar organizational structure). It was also possible to include a different case (CRN) in another context and with a different kind of therapy (occupational therapy), turning it possible to contrast the results with the previous two cases. In CRN it was also possible to interview therapists that decided to use the console and others that decide not to use it.

It was searched some replication between the case studies 1, Click, and 2, Physioemotion, (literal replication) and some variation in the case study 3 (in comparison with the two previous contexts and inside the same organization). This

sampling strategy allowed for external validity to this work (Voss, Tsikriktsis, & Frohlich, 2002; Yin, 2013).

Data Collection

All the organizations were contacted directly by telephone and e-mail. They have been approached to become a case study, according to a case study protocol that was prepared and sent to each one of them. The first contact and some informal conversations with the clinicians started in the end of 2015. Then, in each case, semi-structured interviews were performed in 2016.

The case studies were divided in two phases due the temporal lag that set them apart. In a first phase of the research only the two small physiotherapy clinics were studied. A total of 3 interviews were conducted to physiotherapists of Click (case study 1), and 1 interview was conducted to a physiotherapist of Physioemotion (case study 2).

A case study protocol was prepared for these two clinics, with two interview guides (one for each clinic). Such protocol was divided in the following four sections: a) purpose and motivation for the case studies; b) procedures of data collection b1) Who to Interview; b2) Data Collection Plan; b3) Preparation of interviews; c) Interview Guides; and, d) Informed Consent Form.

Unfortunately, in the case of Physioemotion it was only possible to conduct one interview. However, as the clinic only has two permanent physiotherapists, who are married and own of the clinic, the representativeness of that interview justifies the inclusion of this case study in the research. Moreover, besides those two permanent physiotherapists, the clinic periodically hires one intern that does not stay in the clinic for more than one year, and those are all the workers of the clinic, which reinforces the representativeness of the interview performed.

Physiotherapist	Organization	Duration (min)	Date
1	Click	18:57	09-Jan-2016
2	Click	35:55	19-Jan-2016
3	Click	43:54	04-Mar-2016
1	Physioemotion	22:04	17-Jan-2016

Table 2: Duration (in minutes) and date of the interviews realized in Click Sáude e Bem Estar and Physio(e)motion Saúde e Bem Estar

The possibility to perform a third case study in CRN emerged later from new contacts. The physiotherapists of CRN do not use Nintendo Wii® in rehabilitation, but the occupational therapists do.

For this case a new case study protocol was prepared, which was divided in: a) Purpose of the Study; b) Data Collection Plan; c) Interviews Preparation; d) Interview Guide; e) Informed Consent Form. This protocol was different from the previous because of the specificities of occupational therapy, and of the fact that CRN is a different type of healthcare organization. Six interviews were performed in this center, two occupational therapists that do not use the console in their work and four occupational therapists that use the console in their work.

The elaboration of those protocols provided this work reliability (Yin, 2013).

Occupational Therapist	Organization	Duration (min)	Date
1	CRN	9:23	21-Jul-2016
2	CRN	22:29	21-Jul-2016
3	CRN	07:30	21-Jul-2016
4	CRN	11:59	21-Jul-2016
5	CRN	05:03	21-Jul-2016
6	CRN	06:46	21-Jul-2016

Table 3: Duration (in minutes) and date of the interviews realized in Centro de Reabilitação do Norte.

All the interviews, were semi-structured, recorded and conducted in quiet spaces of the workspace. There was some information derived from e-mail exchanged and informal conversations after the interviews to check or complement some data. The researcher also visited the workspace of the therapists in all the organizations and observe Nintendo Wii® being used in therapy treatments.

The multiple sources of evidence provide this work construct validity (Yin, 2013).

Data Analysis

The interviews were transcribed immediately after being conducted to ensure constant comparison (Eisenhardt & Graebner, 2007). This process was helped by the software Express Scribe. The transcriptions were rigorous and accompanied by several notes taken during the interviews.

Physiotherapist	Organization	Number of transcribed pages
1	Click	8
2	Click	19
1	Physio(e)motion	11
3	Click	18

Table 4: Number of transcribed pages from the interviews realized in Click Saúde e Bem Estar and Physio(e)motion Saúde e Bem Estar

Occupational Therapist	Organization	Number of transcribed pages
1	CRN	4
2	CRN	8
3	CRN	4
4	CRN	4
5	CRN	2
6	CRN	3

Table 5: Number of transcribed pages from the interviews realized in Centro de Reabilitação do Norte

The software used for Data Analysis was NVivo, version 11.11.

Initially the data was codified, using descriptive and simultaneous coding (Miles & Huberman, 1994; Saldaña, 2015), with the codes presented in tables 6 and 7. Due to the specifications of physiotherapy and occupational therapy, and the differences between the small private clinics and the big rehabilitation center, it was convenient to use different coding schemes, one for case studies 1 and 2, and another for case study 3.

Codes	Number of segments coded
Adaptations	16
Adoption	18
Advantages/Positive Points of Nintendo Wii	27
Barriers	24
Direct Competition of Nintendo Wii	8
Disadvantages/Negative Effects of Nintendo Wii	22
Indirect Competition of Nintendo Wii	19
Learning	40
Operational Changes	9
Patients	22
Possible Improvements	4
Utilization	57

Table 6: List of codes used in data analysis and number of segments coded from the interviews realized in Click Saúde e Bem Estar and Physio(e)motion Saúde e Bem Estar

Codes	Number of segments coded
Adaptation	5
Adoption	5
Advantages	9
Games	13
Innovative technologies	4
Learning	16
Limitations	1
Pathologies	3
Patients	30
Utilization	26
Results	4
Operational Changes	8

Table 7: List of codes used in data analysis and number of segments coded from the interviews realized in Centro de Reabilitação do Norte

All the interviews were codified and that information was then crosschecked to compare information obtained within the same organization and across organizations.

Interviews were retrospective, which allowed for a chronologic order of events to be designed for each case study, starting at the first time that the therapists heard about the use of Nintendo Wii® as therapy instrument, throughout the learning process, the adoption decision, the utilization and until the moment of the interview.

Within case analysis of case study 1 was focused in describing the barriers for adoption, the learning process, the Nintendo Wii® use (adaptations, additional technology used with the console, patients' pathologies), and the advantages and disadvantages of using Nintendo Wii®.

Within case analysis of case study 2 was focused in describing the difficulties of using Nintendo Wii®, the learning process, the adaptations required, and the advantages of using Nintendo Wii®.

Within case analysis of case study 3 was focused in describing how the occupational therapists use the console in their daily work, how they learned to use it,

the adaptations they were required to implement, namely concerning the workspace and its characteristics, the advantages of using Nintendo Wii®, and the reaction of the patients to its use.

The explanation that was build intended to give this work have internal validity (Yin, 2013).

With the intent of doing a cross-case analysis the information within the several codes of the semi-structured interviews were compared (Miles & Huberman, 1994) and support tables were built (which are presented in the results section). Being the data displayed in a simpler form, it was easier to analyze the results of each case study and compare them with the other cases results.

At first was done a comparison between the two first case studies, since they were performed in the same period and are similar clinics. After that, those two cases were compared with the case study 3 and some conclusions were made.

4. Results

4.1. Case Study 1- Click Saúde e Bem Estar (Click)

Click started its activity five years ago with the same three physiotherapists that still work there nowadays, were interviewed for this research. The clinic owns a Nintendo Wii® since it opened by decision of its owners. The three physiotherapists have different backgrounds and they learned about the possible use of Nintendo Wii as a therapy instrument from different experiences. Physiotherapists 2 and 3 learned about it in a television show. At the same time, the two of them were working with the Handball Team of Sporting Club da Horta and decided to try using a Nintendo Wii® owned by one of them in some therapies. The other therapist learned about Nintendo Wii® in a brochure from a training company. When the clinic started its activity, the three physiotherapists informally decided to acquire a Nintendo Wii® with a Nintendo Balance Board for the organization to use in some therapy treatments.

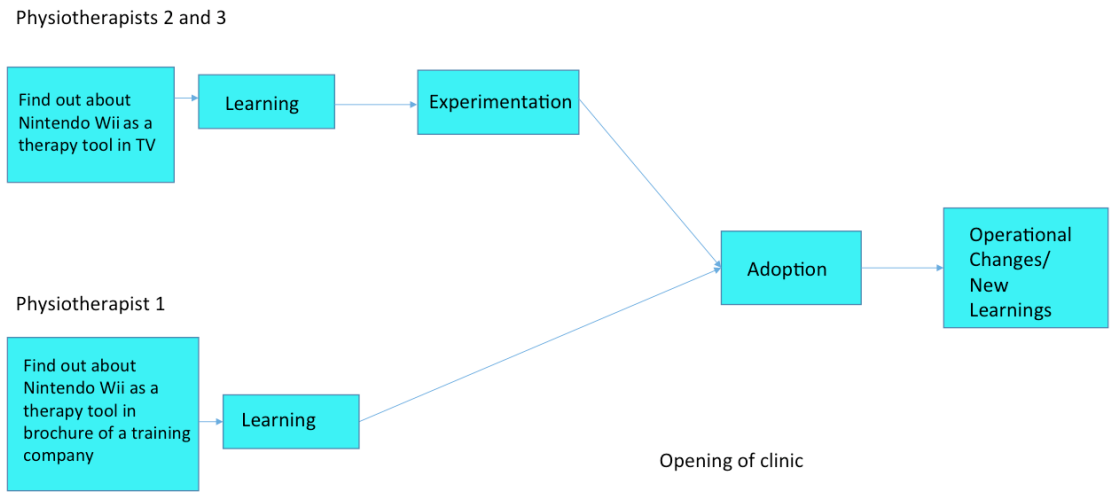

Figure 3: Sequence of events of the implementation process of Nintendo Wii® in Click Saúde e Bem Estar

After they found out about Nintendo Wii® potential as a therapy instrument, a need of getting further knowledge about it emerged. The main resources used for that learning process were academic papers, Youtube videos and their own experiments. The physiotherapist 1 referred that he used some study materials that training company provided as an enticing to attend their course.

Learning (Click)		
1	2	3

• Find out about Nintendo Wii® as a therapy instrument
  ○ Brochure Training Company
↓
• Learning
  ○ Papers
  ○ Study material from the training company
  ○ Videos
  ○ Own experiments
↓
• Experimentation
  ○ At home
↓
• Utilization
  ○ Clinic
	• Find out about Nintendo Wii® as a therapy instrument (indirectly, through Francisco)
	↓
	• Learning/ Experimentation
	  ○ Videos
	  ○ Own experiments
	↓
	• Utilization/ Experimentation
	  ○ Handball
	  ○ Clinic
	↓
	• Utilization
	  ○ Clinic
		• Find out about Nintendo Wii® as a therapy instrument
		  ○ TV
		  ○ Internet
		↓
		• Learning/ Experimentation
		  ○ Videos
		  ○ Own experiments
		↓
		• Utilization/ Experimentation
		  ○ Handball
		↓
		• Utilization
		  ○ Clinic

Table 8: Sequence of the learning process about Nintendo Wii® in Click Saúde e Bem Estar

The adoption process was very simple, there were no barriers to the acquisition of the console or the balance board, the investment was low and the physiotherapists are company's owners or related to some of them, so all of them were part of the decision.

On the other side, there were a few barriers regarding the use of Nintendo Wii®. Such barriers were divided in four groups and are presented in table 9: patients, physiotherapists, clinic's workspace and Nintendo Wii®.

For this analysis, patients were grouped in three groups according to their ages: children, adults and elderly.

Elderly have some problems adjusting to the use of a videogame in physiotherapy since the majority of them had a sparse contact with technology in general and are afraid of using it (this is what is meant with technology resistance in table 9). Another problem of this group of patients is their lack of coordination, which is required for a few games. When they just need to move there is no such issue, but if they need to press some buttons while moving to play the game, some of them become confused. Because of the technology resistance and the fear of doing something wrong (that could damage the console) they feel a little inhibited about using the Nintendo Wii®.

Children have the opposite problem, they can misinterpret the use of Nintendo Wii® in physiotherapy and it can becomes difficult to make them understand that the therapy involves doing other exercises that do not make use of Nintendo Wii®. Moreover, as technology naturals, children easily find out artifices to cheat the console sensors that turn the exercise effortless and, therefore, useless for therapy.

The adults group was not very mentioned in the interviews, with the exception of the players of the Handball Team of Sporting Club da Horta. Those were reported to have a good acceptance of the treatment with the console and results very positive.

The main barrier for physiotherapists to use Nintendo Wii® is the lack of time. The number of patients is too high when compared with the number of physiotherapists

and time constraints lead to neglect the use of Nintendo Wii®, since it requires some preparation time (as will be discussed in the barriers related with Nintendo Wii®). Another barrier for physiotherapists is the absence of deep knowledge about Nintendo Wii®. In their personal lives the physiotherapists of Click do not use Nintendo Wii® for entertainment, when they use any console for that purpose it is PlayStation® from Sony, which some of them know much better than Nintendo Wii®. This makes it more difficult for them to be familiarized with some specifications of the console like the possibilities of connect it to the Internet or to download some demo versions of games to test in therapy.

Concerning the clinic's space, the room offered does not provide the patients with the privacy that they need to perform the exercises without feeling uncomfortable or with some sort of stigma about playing because of the possibility of other watching them while doing the exercise. The space is too limited and conditions the freedom to move adequately, even though the space had been design with the idea of using Nintendo Wii® as a therapy instrument already established. The physical space is not adapted and there is no proper support for the patient to hold on, it requires the use of a chair or the physiotherapists' help to do the exercises, which becomes difficult due to the reduced space.

Nintendo Wii® has some features that prevent its use in therapy contexts as well. Since it has been designed as a console intended to be used for entertainment and not for therapy purposes, it has some characteristics, such as the time that it takes to initialize a game, particularly the Nintendo Wii Fit®, which is the most used game in physiotherapy; the time consumed providing "tips" or "lectures" about health before the beginning of the game; and, the need to customize the game before playing (height and weight, which if not customized correctly can affect the performance of the game and the results obtained). Such characteristics are appreciated when using the console as an entertainment, but become a burden for therapists, who have time restrictions for therapy sessions. It is not possible to skip such "tips" and "lectures", which are responsibility of the therapist to provide in the context of a therapy session, nor to skip

the customization that takes some time. Again, as time is not something that the physiotherapists can spare, they tend to avoid using Nintendo Wii® to be able to perform the treatment sessions in tight schedules

Barriers (Click)			
Patients	Physiotherapists	Clinic's Workspace	Nintendo Wii®
• Technology resistance • Lack of coordination • Shame/Stigma • "Ruses" that turn the exercise easier • Treatment misunderstanding	• Lack of time • Good technology background, but absence of deep knowledge about Nintendo Wii®	• Lack of privacy • lack of space to perform some movements • Not adapted (Patients do not have something to hold on, for example)	• Initializing the games takes too much time • Requires too much customization • Too much time spent giving "tips" and "lectures"

Table 9 – List of barriers that difficult the implementation of Nintendo Wii® in Click Saúde e Bem Estar

The games that are used by this clinic are the Nintendo Wii Fit® (the most used) which requires the use of Nintendo Wii Balance Board® (a board with movement sensors that is connected to the console via Bluetooth), Nintendo Wii Sports® and Nintendo Wii Sports Resort® (which are less used due to the absence of games that are compatible with the use of the Nintendo Wii Balance Board® and, thus, are not so interesting for therapy sessions).

When asked about the use of Nintendo Wii® in physiotherapy all the interviewees said that they use the console mainly in proprioceptive training, more specifically balance training. Nevertheless, other pathologies are treated using Nintendo Wii® as well, such as cerebral palsy, neurological conditions, and training knees after surgeries.

The treatment of those pathologies using Nintendo Wii® is not restricted to the use of the console, its controls, and Nintendo Wii Balance Board®, frequently there are other instruments that are used in addition to make the exercise more adequate to the patient situation, such as Bobath balls, trampolines, sponges and Freeman Boards. These additional instruments can be adapted to use with Nintendo Wii® by putting them above or below the Nintendo Wii Balance Board. It was referred during the interviews that everything that is suitable to use with the Nintendo Wii Balance Board and at the same time create unbalance situations can be used in physiotherapy, since it helps to improve the balance of the patient.

Some other adaptations are made on how Nintendo Wii® games are played in the context of therapy sessions, some too make the exercises more difficult, but most of them to adapt the exercise to the patient or to work a different part of the body than that expected to be used in the game. Sometimes games are played with the patient seated to work the pelvis or the torso, while the game was conceptualized to be played standing up. Furthermore, since the Nintendo Wii requires some capabilities form its players, such as being able to stand up, in some cases standing up for some time, going up and down Nintendo Wii Balance Board and holding the remote, sometimes the physiotherapists help the patient when, for instance in part of a game it is supposed to use the remote while using the Nintendo Wii Balance Board at the same time, they use the remote while the patient is using the board, which was found to be a way of breaking the barrier of "lack of coordination".

Adaptations (Click Saúde e Bem Estar)	
Materials	Playing for therapy
• Bobath Ball • Trampoline • Sponges • Freeman Boards	• Be seated in a game where it is supposed to be standing up • Physiotherapists help patients with "lack of coordination"

Table 10 – List of adaptation made by the physiotherapists of Click Saúde e Bem Estar in the use of the Nintendo Wii®

The use of Nintendo Wii® in therapy sessions has both advantages and disadvantages. One first advantage is the price. In 2006 Nintendo Wii® was launched with a price around $249,99, which is significantly cheaper than its direct competitors: XBOX 360® and PlayStation 3® (the consoles from Microsoft and Sony launched in the same year) that were launched with prices between $299 and $399 (depending on the model) for XBOX 360® and between $499 and $599 (depending on the model) for PlayStation 3®.

The Nintendo Wii Balance Board® is a peripheral device unique for the Nintendo Wii®. Its two main competitors do not have any similar device and do not exist any official statement or even rumors about their intention to create such a device in a near future. The Nintendo Balance Board® is what allows this console to train balance and to exercise the lower limbs, which is particularly important for therapy purposes.

Nintendo Wii® is highly adaptable, which allows to change the exercises, or increase or decrease the challenge created and the efforts that are required during the game to make them more suitable for the intended therapy sessions. The adaptations that were previously described have a very important role in the use of Nintendo Wii® in physiotherapy, and therefore this high level of adaptability gives an important advantage to Nintendo Wii®.

The simplicity of Nintendo Wii® games allows patients to easily understand the body part that they are moving and what they need to do. The feedback provided during exercises is very simple and clear to anyone who is not a therapy professional. It is fun and have goals clearly defined, which makes proprioceptive work a lot easier. As one of the physiotherapists pointed out, it is very different for a person stand on one foot during fifteen or twenty seconds every day during three months or doing that same exercise while playing a Nintendo Wii® game. The motivation is very different and using Nintendo Wii® it is most likely that the patients tolerate to do the treatment until the end.

In proprioceptive work when you have an exercise that is simple, but that you have to stand on one foot during 15 or 20 seconds, it becomes boring. And doing that everyday for a month or two is tedious, so we try to adapt those exercises using Wii platform.

Imagine that you say to an eight years old kid that he needs to stand on one foot during that time. At first he will find it funny, but after a few times he is bored and try to avoid it, becoming more resistant to the treatment. With the Wii he has a different enthusiasm.

Physiotherapist 3, Click Saúde e Bem Estar

While playing Nintendo Wii® patients are distracted, which allows them to execute the same exercises without consciously fearing getting hurt as it usually happens in conventional therapy.

Another advantage is the possibility of release some time from the physiotherapists, which allow them to work with several patients at the same time.

However, Nintendo Wii® also has a few disadvantages that reduce the efficiency of the therapy. First, Nintendo Wii® is only applicable to treat the lower limbs or torso, there is an absence of games for the superior limbs. Even if games appropriate for superior limbs treatment exist or will be developed, the remotes as they are in this moment create a restriction to movements caused by the wire that link the two parts of controller that make such exercises impossible.

Moreover, as Nintendo Wii® operates based in a system of sensors, it is easy to cheat when patients find a ruse to mislead the sensors. One of the advantages of using this console is that it releases some time that the physiotherapists dedicate to each therapy session (while the patient is performing some exercises using Nintendo Wii®), however the possibility of cheating implies that the physiotherapist has to be present all the time supervising the session for some patients (such as children), canceling the previous advantage.

Click Saúde e Bem Estar	
Advantages of Nintendo Wii®	Disadvantages of Nintendo Wii®
• Distraction • Nintendo Balance Board – Balance Training • Good feedback, easier interpretation and explanation • Adaptability • Levels of challenge • Motivation • Release some time of the therapists dedicated to each session • Not expensive	• Absence of games to the superior limbs • Movement Restriction • Easy to cheat

Table 11: List of advantages and disadvantages that the Nintendo Wii® provide to the physiotherapists of Click Saúde e Bem Estar in their work

The console is not routinized, it was adopted, used, but not in a regular basis and sometimes physiotherapists forget to use it in their treatments. The degree of implementation in this case is therefore low.

4.2. Case Study 2- Physio(e)motion Saúde e Bem Estar (Physioemotion)

Physioemotion started its activity with two physiotherapists, who are married and own the clinic at two years ago. Those two physiotherapists are the only permanent clinical staff, and they frequently hire an intern physiotherapist with temporary contracts (that have very few contact with the Nintendo Wii®).

As in the case of Click, when Physioemotion clinic opened they immediately bought Nintendo Wii®. The only barrier identified by the interviewee was the difficulty to acquire the Nintendo Wii Balance Board®. This difficulty probably derived from the fact that despite Pico island has a significant private investment, it is not in the technology commerce, so innovation may take some time to get there.

The driver that led to adopt Nintendo Wii® as a therapy instrument was the same training offered that was mentioned in the case of physiotherapist 1 in Click. This clinic went through an informal adoption decision process to adopt Nintendo Wii®, and adopted the same games as Click (Nintendo Wii Fit®, Nintendo Wii Sports® and Nintendo Wii Sports Resort®).

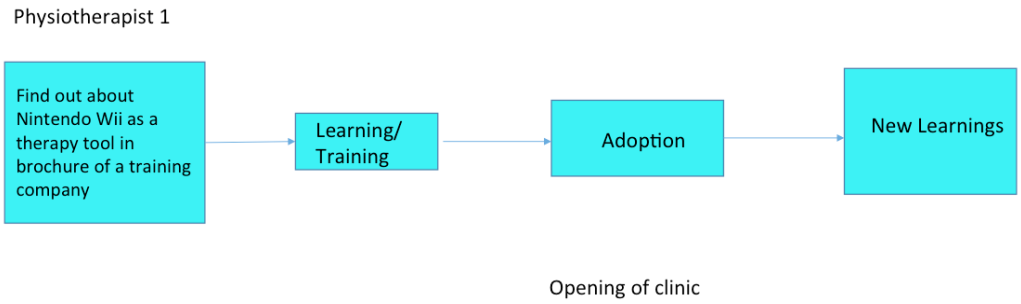

Figure 4: Sequence of events of the implementation process of Nintendo Wii® in Physio(e)motion Saúde e Bem Estar

For the physiotherapists of Physioemotion, the learning process started with the training session provided by the training company that was referred before. Next, they went through a period of experimentation of Nintendo Wii® games by playing themselves. It was referred in the interview that they used Youtube videos to get some ideas and that they have a good coordination between them and have the habit of exchanging ideas between the physiotherapists in their daily work.

It was indicated that the Nintendo Wii® has a good feedback that it is easy for the patients to understand, more intuitive than the use of a mirror during the exercises. The console has no relevance in strength and flexibility training, and it is used mainly in balance and proprioceptive training. The console is more used in the elderly and the athletes from different sports organizations (Lajence, Ribeirense, Candelária, Futebol Club da Madalena) and from different sports (hockey, volleyball, football).

It was referred that the Nintendo Wii® is mainly used to treat injuries related with the neurologic field, strokes, and was widely referred a specific case of a traumatic brain injury that had results very positives with the use of the console.

The work plan in Physioemotion is organized in a way that two different patients do not need to use the console ate the same time, what make possible for them to have only one Nintendo Wii®.

The physiotherapists of this clinic implemented some adaptations similar to those implemented in case 1, namely the use of Freeman Boards and Bobath Balls. Those adaptations are made in the generality of games, but principally in the Yoga games. It was referred that some adjustments in the weight of the patient are done with the objective of the Wii Balance Board® account the extra weigh that, due its sensors, could induce to some imbalances if that was not done. The degree of difficulty of a game is as well adjusted to the condition if the patient that it is been treated, people with more balance related problems start with a low level of difficulty, that will be adjusted as the patient improve.

Other adaptations were made like the patient be seated while playing a game where is supposed to be up and the physiotherapists can help or do something in the game with the objective of making the game easier (for example, a person with lack of coordination in a game where is supposed to use the remotes and the balance board, the patient can use the balance board and the physiotherapist the remote).

Adaptations (Physio(e)motion Saúde e Bem Estar)	
Materials	Ways of Play
• Bobath Ball • Freeman Boards	• Be seated in a game where is supposed to be up • Physiotherapists help or do something in the game • Adjustments in the patients' weight

Table 12: List of adaptation made by the physiotherapists of Physio(e)motion Saúde e Bem Estar in the use of the Nintendo Wii®

The implementation degree in this clinic is deeper that in the case study 1, but since neither all physiotherapists use the console for no indicated reason it is not possible to consider the Nintendo Wii® fully implemented.

4.3. Case Study 3 –Centro de Reabilitação do Norte (CRN)

CRN is a rehabilitation center located in the North of Portugal, more precisely in Valadares. It started its activity in the end of 2013 under the management of Santa Casa da Misericórdia do Porto (an institution of charity and social assistance, philanthropy and public service) and it counts with a multidisciplinary team of nurses, physiotherapists, speech therapists, occupational therapists, medical auxiliaries, social workers, psychologists and operational technicians.

Nintendo Wii® was adopted in the early activity of CRN. It was a donation made by the chairman when some occupational therapists exhibited some desire to use it as a therapy instrument.

In this case study six occupational therapists where interviewed, four who use Nintendo Wii® as a therapy instrument in a regular basis and two who barely use it.

In this case, the adoption process was also very informal. The donation of Nintendo Wii® by the chairman emerged due to a desire expressed by the occupational therapists. The console was donated together with Wii Fit® bundle (Wii Fit® game and Wii Balance Board®) and with the two games that are part of the console bundle: Wii Sports® and Wii Sports Resort®. Thus, CRN has the same set of games as Click and Physioemotion do.

The therapists who use less the console consider that it is a very good work therapy instrument, however they do not use it as much as their colleagues because of the specifications of treatments of the patients assigned to them. One of them was even one of the occupational therapists that exhibited the desire of having the console.

The occupational therapists of CRN did not have any specific training to use Nintendo Wii® during treatments. Nevertheless, two of them referred that they used it in college, while training for be occupational therapists. The remaining therapists knew that some videogames where being used in occupational therapy, but had no deep

knowledge about it. Therefore, the most important learning about how to use Nintendo Wii® in their therapy treatments was through experimentation and combining their knowledge with the possibilities they identify in the games.

In this case few and small adaptations were made. The games are mostly played in the way they are conceptualized to be. The adaptations implemented were the use of weight clamps for muscle training or to sit the patients while doing the exercises for the case of patients who cannot stand up.

The workspace where Nintendo Wii® is used is considered as "the best we can get" by all the occupational therapists that use it in a regular basis. Still, they refer that it would be desirable to have more space and be placed in an environment away from other stimuli. One of the therapists even mentioned that it would be good to have a Nintendo Wii® in the pediatric service, since the console is located in the area where adults are treated, some children feel frighten and embarrassed because it is a space that they did not know before and because of the presence of adults in a different condition than that they are accustomed with, which frightens them. For the therapists who do not use the console so often, the space where it is placed is good enough.

Concerning the games used, as it was referred before they are only three, but the occupational therapists feel that it would be useful to have more, particularly games that could help with cognitive training and games that would prepare patients for daily tasks. The therapists that do not use the console regularly consider that the range of available games is enough. Most of the occupational therapist that were interviewed already knew Nintendo Wii® previously, either from college or internships, or from their personal life, and were familiarized with it, being able to name some games that could be useful in their work (Wii Party® and Mario Kart®, for example).

The advantages of the console identified by the therapists of CRN were: the variety of games and the increasing level of difficulty, which is relevant for treatment since it enables to adjust the degree of difficulty of the game to pathology and the stage of each patient. Moreover, while using Nintendo Wii® for the treatment session, the

patient has a more motivating goal to achieve, for instance, it is more motivating to shoot a ball, even if just virtually, than just make the same movement in the air with no other purpose than merely doing that movement.

Since Nintendo Wii® is very interactive it helps to train the patients to perform autonomously their daily tasks. For children one of those activities is playing, which is what they already do with Nintendo Wii®. In occupational therapy, unlike physiotherapy (according to the two previous cases), the console is used mainly to work the upper limbs.

Generally, patients and their families are very receptive to the idea of using Nintendo Wii® during therapy treatments. Every time a new treatment begins in which therapists use Nintendo Wii®, therapists explain to the patients why they use it and which benefits it will bring. However, there are some patients who are not so receptive to the use of new technologies while being treated, some of whom refuse them. In those cases, therapists avoid or even exclude the use of Nintendo Wii® during treatment sessions.

The console allows developing some positive competition between patients and giving them a feedback, like if they are able to do more points than in previous trainings. The occupational therapists also referred that it allows working some range of motion, muscle strength, muscle coordination and movement dissociation.

Nintendo Wii® has some limitations for occupational therapy, which are the reason for some therapists to not use it so frequently. It is not adequate to be used with some children, who are too young to play the console (patient age). Moreover, some patients do not have cognitive capability to understand the games (cognitive limitations). Other patients have physical limitations that prevent them from using the console. As referred previously, to play Nintendo Wii® patients need to have enough vision accuracy to observe the images transmitted, ability to hold the remote control, ability to go up and down the balance board, and ability to understand the flow of the

game and to follow instructions, and some patients lack one or more than one of those abilities.

Finally, some Nintendo Wii® games are too difficult and require too much precision for some patients. For those cases CRN has another therapy instrument, a videogame called ARMEO® that is much simpler than Nintendo Wii®. On another hand, ARMEO® is criticized for not having a wider variety of games nor the possibility of regulating the game's difficulty. Nintendo Wii® and ARMEO® end up being complementary.

Advantages	Limitations

• Interactive
• Motivation
• Daily Tasks Preparation (for children this "tasks" are playing)
• Positive competition between patients
• Feedback
• Give a goal to the patients
• It allows to work:
  ○ Range of motion
  ○ Muscle strength
  ○ Muscle coordination
  ○ Movements Dissociation
	• Patient Age
	• Cognitive Limitations
	• Physical Limitations
	• Some games are too difficult and require too much precision for some patients

Table 13: List of advantages and disadvantages that the Nintendo Wii® provide to the occupational therapists of Centro de Reabilitação do Norte

5. Discussion

Nintendo Wii® is an entertainment device that has been widely used in healthcare (Agmon et al., 2011; Esculier et al., 2012; Laver et al., 2011; M. Williams et al., 2010). Between the existing three mainstream consoles (Nintendo Wii®, Sony Playstation 3® and Microsoft XBOX 360®) according to the data collected in the case studies, Nintendo Wii® is considered the most suitable for rehabilitation. The implementation of Nintendo Wii® in rehabilitation clinics will be discussed in this section, in light of the data from the three case studies presented in the previous section. In particular, I focus on discussing the adoption process, the pre-implementation stage, the learning process, how Nintendo Wii® is being used in rehabilitation, the adaptations that had to be made, users readiness level, users' acceptance of the innovation (using the technology acceptance model), and the barriers to its use.

According to Linton (2002) the implementation process starts when there is a decision to adopt the innovation. In the cases of Click and Physioemotion that decision was made five and two years ago, respectively. The decision to purchase Nintendo Wii® and Nintendo Wii Balance Board® was informal and it was participative, i.e., the physiotherapists were active part of the decision, even because almost all of them were also the owners of the clinics. The adoption decision was taken before opening the clinics so, in both cases, it was possible to plan appropriate workspaces to accommodate the console, being that in the case of Click the space used was one that already existed and in the case of Physioemotion the whole clinic was built from the ground.

In the case of CRN the adoption decision took place when Nintendo Wii® was purchased (shortly after the CRN had started its activity), triggered by an informal request from the occupational therapists to the chairman. As the clinic was already operating when Nintendo Wii® was adopted, the console was accommodated in the workspace that was considered most appropriated to use it, and no particular planning was possible to accommodate it properly.

In the three cases, the adoption did not have a negative impact in the implementation process because the therapists were the ones who decided to use it. Moreover, in Physioemotion the workspace was fully adapted to the console and there were no complains about how it could create difficulties to incorporate the console in the daily activity. However, in Click and CRN the spaces were not adapted to the use of Nintendo Wii®, even though Click decided to adopt it before opening the clinic, which did not happen in the case of CRN. In both Click and CRN, there is no place for patients to hold on when they have difficulties performing the exercises by themselves. In Click there was also a lack of space, lack of privacy, and excess of stimuli in the place where Nintendo Wii® is placed. In CRN there are no separated rooms for children and adults to use Nintendo Wii®. From this data and from the main barriers pointed to the use of the console, which are listed later on, it is then possible to conclude that the degree of adaptation of the workspace receiving the console, influences its use in rehabilitation.

After the decision to adopt, the therapists of Click, Physioemotion, and CRN begun learning about the new console by performing a few experiments by themselves and with some patients. In the case of Click, some of the experiments with patients took place before opening the clinic, with some handball players of Sporting Club da Horta. In the case of CRN, some of the occupational therapist had already used Nintendo Wii® in former internships. Such experiences evidenced to help both for the adoption decision and in the learning process within the implementation, which is in line with Klein and Sorra (1996) when they argue that the implementation process sometimes involves a series of controlled experiences and that it is not an automated process. As one of the physiotherapists of Click expressed:

Obviously that I had some patients that were, "test subjects", to see what was the response that Wii could give me in terms of treatment.

-Physiotherapist 2, Click Saúde e Bem Estar

This can be considered a pre-implementation stage since most of the therapists were not prepared to use the console in therapy and they needed to collect information

about its use before deciding to adopt it. In the case of both physiotherapy clinics this learning prior to the adoption helped in the adoption decision, since the therapists were also the owners of the clinics and need to know if the console would fulfill their needs.

As it was referred previously, Choi and Moon (2013) identify four different forms of implementation: Mechanical Implementation, Learning, Reinvention and Mutual Adaptation.

In the three case studies it was possible to identify that the implementation of Nintendo Wii® in rehabilitation happens as a Mutual Adaptation process, where both adopters and the innovation go through a process of adaptation. Physiotherapists and occupational therapists needed to learn about how Nintendo Wii® could be used in therapy and to adapt how to perform some treatments and how Nintendo Wii® would be played in therapy sessions, which has significant differences from entertainment, namely the use of external equipment that are not originally supposed to use with the console and play the games in a different way to be more adapted to the treatment. That equipment was introduced in small cycles during their experiments.

From the data collected, the implementation could also be considered as mechanical since the console and the games do not suffer any kind of change and the amount of knowledge necessary to use it was minimal. The console and the balance board were purchased, and the interesting games to use in rehabilitation came with them. The console was purchased and considered "ready to use", which implies that even if there is a mutual adaptation, the process was perceived as mechanical by those who decided to adopt it. However, if we conceptualize Nintendo Wii® as a modular technology, comprising the console, the balance board, the games, and any other technological module used to play it, then the introduction of conventional therapy instruments to change the level of difficulty of the exercises performed using Nintendo Wii® may be considered an adaptation of the technology (the introduction of new modules), even though it is a change completely controlled by the user. Therefore, the adaptations taking place during the implementation occur both in the innovation and in

the adopter. With this rationale in this work it is considered that the implementation happens as mutual adaptation with some sort of mechanical character.

Leonard-Barton (1988a) states that the need of adaptation comes from misalignments between the user's environment and the innovation as they are in their original conceptualizations. Therefore they need to go through some adaptations to converge to a point where they are aligned with each other, when the innovation is used in its full potential and adds value to the user's activity.

In the case of the implementation of Nintendo Wii® in rehabilitation, adaptations occurred in the innovation, namely by combining the use of Nintendo Wii® with Freeman Boards, Bobbath Balls, and other therapy instruments to adapt its mode of operation to the therapy needs, and in the adopters' practices, through new learning and adapting work practices and treatments to be able to use this innovation.

Nintendo Wii® was originally conceptualized to be used for entertainment. Its games have an appropriate way to be played and, even though it is intended to be a healthy entertainment, it was not design for being used as an instrument for rehabilitation. The adaptations adopted were those required to take full advantage from the console in the context of rehabilitation, i.e., to adapt the exercises to the condition of the patient, making them more difficult or easier, or adjusted to the patient's limitations of the moment.

Namely, Nintendo Wii® was adapted in the following:

- In Click and in Physioemotion, the physiotherapists used some conventional instruments of therapy together with Nintendo Balance Board®, namely Bobath balls, trampoline, Freeman boards and sponges.
- In CRN, very few adaptations were made and they are not very different from those of Click and Physioemotion. Sometimes therapists used weight clamps (another conventional instrument of therapy) and when

needed some patients also play sited games that are suppose to be played standing up.

From analyzing the adaptations that involved the innovation, they were small as of adaptation (Leaonard-Barton, 1988) of introducing new technologies to create new and more or less challenging playing conditions.

The therapists had to learn about how to use Nintendo Wii® and had to earn new skills, in the case of Physioemotion using a more formal approach (through a specific training provided by a company) and in the other two cases using a more informal and unstructured approach of learning by doing.

On the other hand, the therapists did not have to change their roles or working norms, because the decision to adopt the console did not come from a higher hierarchy, they where part of the decision or it was a proposal made by them, so it only had impact on their working routines. In the two physiotherapy clinics the physiotherapists are owners of the clinic, so they did not have a top-down decision, even in the case of Click where there are more partners than physiotherapists. In the case of CRN the acquisition of Nintendo Wii® was made by a top manager of the company, but it was at the therapists request. In the three cases the decision to use the console for each treatment session is made by the therapists according to their evaluation of the patient.

At the same time, the users of Nintendo Wii® are different, some of them facilitate and others difficult the use of the consoles. In the case of physiotherapy clinics, users can be divided in workers or physiotherapists and clients or patients, and there are some relevant differences between these two groups that influence the implementation of Nintendo Wii® in rehabilitation.

Users were divide in “Physiotherapists” and “Patients”, and the latter were subdivide into “Children”, “Adults” and “Seniors”. These users have different degrees of readiness to use Nintendo Wii® (table 14).

Physiotherapists are all young adults (between 29 and 35) with a good technological background, entrepreneurs with a good receptivity to innovation, and

therefore their readiness to use Nintendo Wii® may be classified as "High". In the adoption/assimilation processes they needed to do some research to find if Nintendo Wii® was really usable in physiotherapy and after their decision they had to learn about the console to own the knowledge required to use it appropriately in rehabilitation. In the end, in Click the console is used with some sort of forgetfulness and lack of dedication to overcome the problems encountered, and in Physioemotion it is used in a regular basis.

Children in general are quite willing to accept new technology and seem to instantly know how to use it. Their readiness was therefore classified as "High/Exaggerated" since while they are prepared to use the console without problems, they also are able to easily find out how to cheat Nintendo Wii® sensors. If they are not supervised carefully by the physiotherapists they can easily skip the objective of the treatment and, consequently, the use of the console becomes more prejudicial than useful for treatment. Children could also tend to refuse or try to skip the remaining of the treatment that is not performed with Nintendo Wii®, since they prefer to play the console than do other practices. Thus, therapists need to carefully explain to children why they play Nintendo Wii® during treatment sessions and to control while children use the console.

Adults are generally not mentioned in the interviews, since the physiotherapists tend to use Nintendo Wii® more with children or seniors, because the former get easily bored with the traditional treatment and prefer the console, and the latter suffer, in general, from some conditions related with balance as, for example, the vertiginous syndrome, for what Nintendo Wii® is highly recommended by physiatrists. Adults present no particular difficulties in using the console. They just appreciate an explanation about what they will work with Nintendo Wii®. Therefore, their readiness level was considered a "Medium/High".

Seniors are the group that benefit the most from using Nintendo Wii®, since it is especially effective in helping to reduce fall episodes (Agmon et al., 2011; Jung et al.,

2009; Toulotte et al., 2012; M. Williams et al., 2010). However, at the same time this is the group of patients with more difficulties to use the console because generally they have sparser contact with new technologies and in the particular case of Click they have the problem of exposure (being observed by other people while using Nintendo Wii®, which makes them less willing to accept to use the console). In the end they never really refuse to use it, but they frequently need therapists to persuade them and carefully explain the treatment. For those reasons their readiness level was classified as "Weak".

Users	Users Subgroup	Users Readiness	Adoption/ Assimilation	Implementation/ Consequences
Physiotherapists	-	High	Experimentation/ Learning	Utilization with some sort of forgetfulness and lack of dedication to overcome issues in case study 1 and regular use in case study 2.
Patients	Children	High/ Exaggerated	Explanation Control	Utilization as it is indicated by the physiotherapist.
	Adults	Medium/ High	Explanation	
	Seniors	Low	Explanation Persuasion	

Table 14: Users and their readiness and adoption/assimilation, and the results of the implementation of Nintendo Wii® in Click Saúde e Bem Estar and Physio(e)motion Saúde e Bem Estar

In the case of CRN the division of users was similar to the one used in the two physiotherapy clinics. The users were divided in "Occupational therapists" and "Patients", and the latter subdivided in "Children" and "Adults" (table 15).

Occupational therapists have, in general, a good background about how to use Nintendo Wii® and significant previous knowledge about it, and therefore their level of readiness was considered "High". These therapists performed some experiments by themselves and with some patients to understand the better way to use the console in treatment. Furthermore, they also had to go through further learning. The console is used in a regular basis with patients that have the capabilities required to use it.

Some patients refused to use Nintendo Wii® in their treatment, a situation that did not happen in the other two case studies.

Children in general are quite willing to accept new technology and they seem to instantly know how to use it. Therefore, their level of readiness was classified as "High". In this case, therapists did not mention the problem of cheating the sensors. However, they also mentioned that children could tend to refuse or try to skip the other parts of the treatment that do not involve the use of Nintendo Wii®. Therapists need to explain to the children and their relatives why they use Nintendo Wii® and that they still need to perform other activities not involving the console for a complete treatment. In this case the console was also being used with educational purposes, such as to practice the respect to others and to know how to deal with loosing.

In this case there was no distinction between adults and seniors, they were all called adults. In this group different reactions to the use of Nintendo Wii® were observed. Some adults, those who usually reject treatments involving new technologies, refused it and, according to the occupational therapist, no persuasion efforts could change that. Others accepted it immediately, even some seniors, which in the other two cases were the most difficult group of patients to convince using Nintendo Wii®. A few others needed some persuasion and explanation but in the end they accepted to use it.

Due to this large variety of reactions observed, the level of readiness of this group of patients was classified as "High/Medium/Low".

Users	Users Subgroup	Users Readiness	Adoption/ Assimilation	Implementation / Consequences
Occupational therapists	-	High	Experimentation/ Learning	Regular use by those whose patients have capabilities to use the console
Patients	Children (and their families)	High	Explanation Control	Utilization as it is indicated by the occupational therapists. Some healthy competition between the patients is encouraged.
	Adults	High/ Medium/ Low	Explanation Persuasion Refuse	

Table 15: Users and their readiness and adoption/assimilation, and the results of the implementation of Nintendo Wii® in Centro de Reabilitação do Norte

The level of readiness of the groups of users is expected to be influenced by the concepts of perceived usefulness and perceived ease of use from the Technology Acceptance Model (Davis, 1989).

All the therapists interviewed recognized the usefulness of Nintendo Wii® as a therapy instrument. However, they also referred that it has some limitations, as it was referred in the results section. Those limitations consisted mostly in some patients not being able to use the console: babies and people who cannot hold the remote or do not have the cognitive capabilities to understand the game. Those limitations are not a problem in the implementation process since they are due the characteristics of the patients and their pathologies. They only limit the range of patient conditions that can be treated using Nintendo Wii®.

Moreover, Nintendo Wii® is perceived as being easy to use and to learn how to use. But at the same time physiotherapists refer that the console is too much time consuming, which can be an important limitation for its ease of use. Such difficulty complicates the implementation process in the physiotherapy clinics since, sometimes, even though it might be very useful, it takes too much time to set up, which creates resistance to use it.

In this context, it is possible to observe what Linton (2002) refers about the incorporation: Click (the clinic of case study 1) is satisfied with the performance of Nintendo Wii®, but it is not taking advantage of its full potential, because physiotherapists frequently resist to use it due to the set up time, and, therefore, the results being retrieved from the console are not optimized. Following the arguments of Klein and Sorra (1996), the implementation of Nintendo Wii® in this clinic is facing a risk of failure, since therapists use the console with less frequency, consistency and regularity than it is necessary for the full potential of the innovation to be retrieved. One of the physiotherapists mentioned:

Sometimes I forget that [Nintendo] Wii® is there. If there is a lot of work… I forget. … I do not say that every week I use it, but… […] *It is used a few times every month.*

-Physiotherapist 3, Click Saúde e Bem Estar

Nintendo Wii® may be divided into five modules:

a) The console itself
b) Sensors Receptor
c) Balance Board
d) Controllers
    a. Wii Remote
    b. Wii Nunchuck (a second remote that is used in games that involve moving the two hands)
e) Games
    a. Wii Fit
    b. Wii Sports
    c. Wii Sports Resort

With this division, it is possible to identify small improvements that make Nintendo Wii® more suitable to physiotherapy. When most of the interviewees were asked about what could be modified to better suit Nintendo Wii® to the therapy context, they suggested adding some conventional therapy instruments to the controllers or the balance board in order to use the potential of the games, with the challenges they are looking for.

The most problematic module seems to be "Games", due to the previously mentioned lack of games specifically conceptualized for rehabilitation.

As it is referred by Klein and Knight (2005) many innovations are imperfect. In the case of Nintendo Wii®, its games are not conceptualized and ready for the rehabilitation context. Consequently, this innovation is imperfect for that context, which could lead to a use less frequent than required to take full advantage from its benefits.

Particularly the game Nintendo Wii Fit®, which is the most referred game in the literature that considers the use of Nintendo Wii® for physiotherapy (Agmon et al.,

2011; Esculier et al., 2012; Laver et al., 2011; Saposnik et al., 2010; Theng et al., 2010; Tidbury et al., 2015; M. A. Williams et al., 2010), is quite educational and very customizable, characteristics that can be appealing in a didactic context, but that are too much time consuming for the physiotherapy context: The tips that the game provides, the "lecture" about health, the "critics", the need to build characters for each player, the need to input user's characteristics, the non-existence of the possibility of generating a standard character with some specific characteristics. Those features are very attractive for a product that targets didactic purposes, but for the physiotherapy context where sessions are time limited, it causes reluctance to use the console.

Time consumption was the most referred problem. Unlike what Klein and Knight (2005) refer about the decrease of efficiency and the slowdown of work at the beginning of the implementation process, in this case, the innovation itself is more time consuming than the traditional methods, a characteristic that does not dissipate with a routine use of the console, which makes it less attractive to be used and, therefore, be at risk of being abandoned. However, this is not one of the cases where the innovation is abandoned, but is far away from being routinized.

In the case of Physioemotion, according to the interviewee the console is used with regularity, and the therapist was not able to explain how patients are treated without Nintendo Wii® for the same pathologies where they use it, which suggests a higher dependence of the console when compared to Click. However, it was also referred that not all the physiotherapists of the clinic use Nintendo Wii® as therapy instrument and therefore it was not possible to draw more confident conclusions about the degree of implementation of Nintendo Wii® in Physioemotion.

As mentioned before, physiotherapy and occupational therapy are different rehabilitation disciplines, and therefore, the problems listed and explained for physiotherapy have a different impact for occupational therapy.

All the physiotherapists interviewed referred the importance of Nintendo Balance Board® for their therapy sessions. However, occupational therapists do not use

that module as much, because Nintendo Wii® is mainly used for upper limbs therapy, which reduces the value of Nintendo Balance Board® to those professionals when compared with the physiotherapists, and leads to a lower importance of the game Nintendo Wii Fit®.

Nevertheless, occupational therapists also pointed out some limitations of the console, namely the lack of games that allow to work different type of movements and to do cognitive training. Therefore, it is possible to conclude that both kinds of therapy need further games, with different characteristics more appropriate to each kind of therapy.

To summarize this discussion it is possible to state that in the three presented case studies the adoption process was simple and the adoption decision was informal. At a pre-implementation stage, therapists needed to acquire new knowledge and develop creative efforts to include the console in their therapy sessions, since the majority was not prepared to use it previously. In the cases of the two physiotherapy clinics that pre-implementation stage had a strong impact in the adoption decision, and in the three cases it certainly had a positive influence on the implementation process since after the pre-implementation stage the therapists were conveniently prepared to start the implementation. The implementation occurred as a mutual adaptation, but at the same time with some characteristics of a mechanical implementation because adaptation efforts were required small cycles of implementation. The implementation of Nintendo Wii® in rehabilitation involves several groups of users, and therefore during the implementation process had to be built-in with different levels of user readiness and different perceptions of the console's usefulness: all therapists have a high level of readiness but the patients exhibit diverse levels of readiness; Nintendo Wii® was perceived as useful by all the therapists that were interviewed, however only some patients recognize it as useful, usually those patients who used it in their treatments. Finally, Nintendo Wii® is not being used in its full potential due the lack of games prepared for each kind of therapy. However, when there is resistance to use it, such as in the case of Click, this phenomenon is amplifying, while when therapists become used to

use the console and cannot describe how to perform some treatments without it, such as the case of Physioemotion, this phenomenon is mitigated.

To complete this discussion table 16 analyses the implementation success factors of Greenhalgh et al. (2004).

Success Factors	
Relative Advantage	When compared to its competitors of the entertainment sector, Nintendo Wii® has a significant relative advantage (for both physiotherapy and occupational therapy) because of the Nintendo Balance Board® (for physiotherapy) and because it was conceptualized centered in the movement of players. Comparing to other therapy instruments it has the advantage of being cheap, simple for the patient to understand how to use it and for the therapists to explain complex exercises, and providing a complete set of feedback for the user. In case study 3 it was referred that Nintendo Wii® has the advantage of being very interactive and providing a set of goals to the patients that prepare them to the functions that are intended to recover.
Compatibility	The physiotherapy clinics and CRN are said to be innovative enterprises. Therefore, the use of an innovation such as Nintendo Wii® confirms that premise.
Complexity	Nintendo Wii® is known by its simple design and intuitive usability, whereas therapists agree with that, it is not complex for them to use it, they also referred that it could be complex for some senior patients at the beginning. However, after patients use it a first time, they consider it simple and even

	enjoy it, which facilitates its implementation.
Triability	The possibility to try out an innovation in a limited basis makes it easier to implement and assimilate. In this case, since Nintendo Wii® is originally an entertainment console that some of the therapists own and which is accessible to try in many retailer stores in Portugal, it is possible to consider that the degree of triability is very high in the Portuguese mainland. However, the possibility of trying the console in the same retailer stores located Faial and Pico Island is very limited, if not inexistent, which makes the degree of triability in those specific locations to be very low. The degree of triability of Nintendo Wii® in CRN location is very high. The triability of the Nintendo Balance Board® on retail stores in any geographic territory is limited or inexistent. However, since the most of the therapists already possess a console and a balance board they had the opportunity to experiment the console previously to their use in rehabilitation, which motivated them to adopt it for therapy.
Observability	Therapists easily perceive the benefits that Nintendo Wii® may bring to them and most of the patients like to use it and understand its benefits, which facilitates its use and, therefore, its implementation.
Reinvention	Nintendo Wii® has a high potential of reinvention, in fact the idea of using of the console in rehabilitation is itself a reinvention, since Nintendo Wii® was conceptualized for entertainment and not for health practice. It is a console very adaptable to the circumstances and needs of patients, although

	it can be improved to be better suit the rehabilitation needs. The console requires some sort of creative effort by the therapists, with the intent of adapt it to the pathologies that are been treated. However this adaptation is considered small, because the therapists may decide what and how to do with the console by themselves.
Risk	Nintendo Wii® presents almost no risks since it has a relative low price when compared with other conventional and non-conventional therapy instruments (which makes it a very small financial risk when compared with others). It is also relatively simple to acquire and it is easy to find free information about how to use it, which facilitates its adoption, learning process, use and, therefore, its implementation. The risk that is important to mention and threatens the implementation is the risk of abandoning the console due to the fact that some of its features are too much time consuming.
Task Issue	The main task intended to be fulfilled by Nintendo Wii® is to provide some distraction while performing repetitive exercises, balance training and work of the inferior and superior limbs, which it helps perform very well, although there is still some room for improvement as mentioned before. The fact that the console fulfills its main tasks facilitates its implementation and the motivation to use it.
Knowledge Required	Nintendo Wii® does not require a great effort to learn how to use, since it is very simple and intuitive. Concerning

to Use It	rehabilitation it mainly requires the therapist some knowledge about the games and imagination about how to use them. The fact that the efforts to know how to use this innovation are minor facilitates the implementation, since it requires little effort to be adopted.
Augmentation/Support	This is where Nintendo Wii® fails. The therapists do not have specific incentives to use the console, and Nintendo does not have a connection with the clinics that use the console in rehabilitation to inform about improvements, new games, or even give some proper and official training about the use of Nintendo Wii® in rehabilitation. The support that is offered is the two-year warranty that is legally required by the Portuguese law and the customer support service, which provides repairs and substitutions after the warranty period. The contact between Nintendo and the clinics could be useful due the fact that the therapists referred that they need games with different features. These games may exist already, but the information of their existence does not reach the therapists. On another hand, if the games do not exist Nintendo cannot develop them since it is not aware of those needs. This lack of communication influences the implementation process since, as it was referred previously, the kind of games that clinics use have a strong influence in the utilization of Nintendo Wii® and, therefore, in its implementation.

Table 16: The relation between the case studies and the success factors presented by Greenhalgh et al.

6. Conclusions

This dissertation was motivated by the importance of the implementation of innovations in the healthcare industry, and was focused on the implementation of videogames (namely the console Nintendo Wii®) in rehabilitation (physiotherapy and occupational therapy). The main goal was to understand how Nintendo Wii® was implemented in rehabilitation clinics. An inductive multiple case study with three cases was conducted to achieve this goal.

This work is expected to bring some contributions to the literature about implementation and implementation on healthcare, more specifically the implementation of videogames in the healthcare sector, a topic where research is still scarce.

This study led to find that in the three case studies the decision to adopt Nintendo Wii® was simple, informal, and had no particular influence on the implementation process. All the clinics went through a pre-implementation stage, which was important to conveniently prepare the implementation process. The implementation occurred as a mutual adaptation, although it had some characteristics of mechanical implementation because the adaptation efforts required small cycles of implementation. In such implementations, where there are different users, in this case therapists and different categories of patients there are also different levels of readiness to use the console and different perceptions about its usefulness. Finally, although Nintendo Wii® is not being used in its full potential, when there is resistance to use it that phenomenon is amplified, while when the console becomes routinized this phenomenon is mitigated.

Although it is possible to draw several conclusions from this work, there are some limitations that need to be considered. CRN is located in a location with very distinct characteristics from the two physiotherapy clinics and has a much bigger dimension and different structure than those two other cases, Moreover, the therapists that use the Nintendo Wii® in CRN are not from the same professional class than the

professionals of other cases. Those differences are important to establish bring diversity to the study and to contrasts with the other two cases, which are very alike among them, but at the same time the differences may bring some "noise" to the study that may influence the analysis. The fact that the case study of Physioemotion was supported in just one interview and another interview was not possible to perform is also a limitation since it made impossible to confirm some data and perform a deeper study such as in the cases of Click and CRN.

Several directions for future work have been identified. There is a need of more research on the implementation of videogames in the healthcare industry, it would be important to perform further case studies in other healthcare providers that also use videogames as therapy tools (Nintendo Wii® and other consoles and further games). For instance, there seems to be potential for some videogames to work as painkillers, and the adoption and results of those therapies would also be interesting to consider. It would be also interesting to study what the impact that the participation and support of the manufacturer of an entertainment console (in this case Nintendo), that was designed to be used in entertainment but is being used as a therapy instrument, could have in the implementation process.

Furthermore, videogames have the potential to play a role in other domains, such as education. Although there is already some research in that domain, it would still be interesting to expand research on the implementation of videogames in several serious domains of application.

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8. Appendix A –Protocol used in the case research (in Portuguese)

Protocolo dos Casos de Estudo

Orlanda Filipa Jacinto e Simas, Faculdade de Economia da Universidade do Porto

Introdução ao estudo de caso e propósito do protocolo

Este estudo de caso insere-se no âmbito de uma dissertação do Mestrado de Economia e Gestão da Inovação da Faculdade de Economia da Universidade do Porto sobre o Processo de Implementação da Nintendo Wii® em Clínicas de Fisioterapia.

Tipicamente os videojogos estão altamente associados a um estilo de vida sedentário, obesidade, comportamentos socialmente indesejados, epilepsia, dependência, entre outros. No entanto, têm surgido cada vez mais estudos com os benefícios dos videojogos em diversas áreas e mesmo alguns com premissas muito diferentes daquelas a que eles estão associados.

Na área da saúde têm sido adoptadas algumas destas inovações dos videojogos como meios terapêuticos. Esta adopção exige um processo de implementação muito cuidado, na medida em que as escolas portuguesas das diversas áreas da saúde ainda não preparam os futuros profissionais de saúde para lidarem com este tipo de procedimentos.

A consola que será utilizada para a realização dos casos de estudo será a Nintendo Wii®, consola cujo circuito de funcionamento consiste em: a própria consola, o jogo ou software que será corrido na mesma, um ecrã de televisão (ou um outro periférico com capacidade de transmitir imagem), controlos remotos sem fios, *balance board* e o sensor de recepção dos dispositivos wireless. A utilização desta consola como instrumento terapêutico exige que o paciente tenha capacidade de visão suficiente para observar o ecrã em que são transmitidas as imagens, capacidade de segurar no controlo remoto, capacidade de subir e descer da *balance board* e capacidade de compreender o funcionamento do jogo, bem como de seguir instruções (Laver, Ratcliffe, George, Burgess, & Crotty, 2011). A utilização da consola pode, dentro de certos limites, ser adaptada às especificidades do paciente.

Assim sendo, com estes casos de estudo, pretendo observar o processo de implementação da Nintendo Wii® em duas clínicas de reabilitação motora, saber como foi o processo de adaptação a um método que não o convencional, como foi a aceitação e adaptação por parte dos terapeutas à consola, quais foram o resultados, como foi a aceitação dos pacientes e outros interessado, se existem diferenças de resultados entre a utilização dos jogos convencionais e do *software* de fisioterapia, entre outras possíveis questões relevantes.

A consola Nintendo Wii® foi lançada pela Nintendo em 2006 e tem sido objecto de interesse em estudos de reabilitação e da sua apropriabilidade como instrumento de terapia os últimos anos.

Este protocolo será utilizado como guião na elaboração destes casos de estudo e aqui estarão presentes as informações sobre os procedimentos esperados realizar no âmbito da recolha de dados, questões principais que serão linha orientadora das entrevistas e às quais pretende-se que seja obtida resposta e a estrutura base da dissertação que será elaborada com base nestes casos de estudo.

Procedimentos de Recolha de Dados

Quem entrevistar

- Fisioterapeutas da Clínica Click Saúde e Bem Estar, número previsto 3
- Fisioterapeuta responsável pela aquisição da Nintendo Wii® e dos respectivos jogos para terapias da Clínica Click Saúde e Bem Estar
- Atuais pacientes da Clínica Click Saúde e Bem Estar que utilizem a Nintendo Wii® como instrumento de terapia
- Antigos pacientes da Clínica Click Saúde e Bem Estar que tenham utilizado a Nintendo Wii® como instrumento de terapia
- Fisioterapeutas da Clínica Physio(e)motion Saúde e Bem Estar, número previsto 2
- Fisioterapeuta responsável pela aquisição da Nintendo Wii® e respectivo software de terapia da Clínica Physio(e)motion Saúde e Bem Estar.
- Atuais pacientes da Clínica Physio(e)motion Saúde e Bem Estar que utilizem a Nintendo Wii® como instrumento de terapia
- Antigos pacientes da Clínica Physio(e)motion Saúde e Bem Estar que tenham utilizado a Nintendo Wii® como instrumento de terapia

Número de entrevista esperado: entre 5 a 7
Duração prevista de cada entrevista: 40 minutos para fisioterapeutas, 15 para potenciais pacientes

Plano de Recolha de Dados

Está previsto que a maior parte dos dados recolhidos seja proveniente das entrevistas realizadas com base no guião seguidamente apresentado. Será entrevistados elementos da mesma categoria profissional em cada uma das clínicas onde será efectuado o estudo, esperando-se obter um maior rigor científico. As entrevistas serão gravadas sempre que tal seja possível bem como será feito recurso a apontamentos.

Preparação das Entrevistas

As entrevistas aos fisioterapeutas estão dependentes da disponibilidade dos mesmos. Estes já foram informados sobre o propósito da entrevista, e ser-lhes-á fornecido um termo de consentimento informado que garantirá que têm toda a informação sobre a sua participação no estudo e que nele participam de forma voluntária. Este termo de consentimento informado é incluído em anexo.

Será dado, previamente, um enquadramento da dissertação aos entrevistados, sendo-lhes também dado o tempo necessário para se prepararem para a entrevista, pois muitas questões se centrarão em acontecimentos passados. Outras questões serão referentes a acontecimentos presentes, enquanto que outras serão relativas a potenciais acontecimentos futuros.

No início de cada entrevista farei uma breve exposição sobre no que é que consiste a dissertação de mestrado no âmbito da qual este estudo está a ser feito, da relevância do tema em análise, bem como da necessidade de elaborar este estudo. Alguns dos fisioterapeutas entrevistados terão também outras funções/interesses nas respectivas empresas que não apenas o de trabalhadores da mesma e poderão ser colocadas algumas questões nesses âmbitos.

Questões do Caso de Estudo

A. Questões Clínica Click Saúde e Bem Estar

1. Como é que surgiu a ideia de adoptarem a Nintendo Wii® como instrumento de terapia?
2. Quantas consolas (Nintendo Wii®) a empresa detém? Alguma vez sentiram a necessidade de ter mais ou menos? Porquê?
3. Consideram a Wii® complexa?
4. Relativamente aos jogadores de Andebol do Sporting da Horta
   - 4.1. Quantos jogadores foram tratados utilizando como meio auxiliar a consola Nintendo Wii®?
   - 4.2. Qual a faixa etária dos jogadores?
   - 4.3. Porque é que decidiram utilizar este método ao invés de outro?
   - 4.4. Foi um método bem aceite?
   - 4.5. Comparativamente às terapias tradicionais, que diferenças é que foram notadas? Houve resultados diferentes? Se sim, de que tipo?
5. A Wii® foi utilizada como como instrumento terapêutico em que outras pessoas?
   - 5.1. De que idades?
   - 5.2. Que características as distinguem de modo a considerarem que este método é adequado?
   - 5.3. Foi bem aceite?
   - 5.4. Que resultados obtiveram?
6. Como é que descreveriam o método tradicional? E o novo método, utilizando a Wii®?
7. Tiveram algum resultado negativo em que tivessem de regressar aos métodos tradicionais? Porquê?
8. Alguém experimentou a terapia com a Wii® e preferiu voltar aos métodos tradicionais? Porquê?
9. Que limitações e dificuldades enfrentaram (Barreiras potenciais na implementação? Mesmo que não sejam internas, barreiras por parte dos pacientes, do espaço)? Que limitações e dificuldades imaginam que enfrentariam caso as circunstâncias fossem outras (instalações diferentes, população diferente, concorrência diferente, etc.)
10. Pretendem continuar a investir neste tipo de terapias?
    - 10.1. De que forma?
    - 10.2. Se pudessem/surgisse a oportunidade, investiriam em outros tipos de terapias que não aquelas a que estão habituados?
11. Sentem que o factor videojogos é diferenciador relativamente à concorrência?

12. Sobre a implementação?
    12.1. Como implementaram esta inovação na clínica?
    12.2. Sentiram dificuldades?
    12.3. Foi de habituação automática?
    12.4. Tiveram de fazer experiências ou adaptações?
    12.5. Descobriram alguma oportunidade durante o processo de implementação? (algo em que ainda não tivessem pensado, mas que surgiu quando trouxeram a Wii® para a empresa?)
    12.6. Alguém (fisioterapeutas) rejeitou a inovação? Porquê? E sem ser por parte dos fisioterapeutas? Porquê?
    12.7. Cada terapeuta utiliza a Wii de forma diferente ou têm uma espécie de protocolo a seguir? Se tiverem protocolo, está documentado? Posso obter uma cópia?
    12.8. Sabiam todos trabalhar com a Wii® previamente? E sabiam como adaptar a terapia ao aparelho?
    12.9. Como é que se "formaram" para utilizar a Wii®?
    12.10. Que jogos/softwares é que utilizam? Fazem experiências com outros jogos? Acrescentam alguma coisa ao "portfólio" de jogos? Se sim, com que regularidade?
13. Houve outro tipo de inovações que implementaram na clínica nos últimos tempos? E sem ser nos últimos tempos? (com inovações estou a assumir qualquer coisa que saia do método tradicional)

B. <u>Questões Clínica</u> Physio(e)motion Saúde e Bem Estar
    1. Como é que surgiu a ideia de adoptarem a Nintendo Wii® como instrumento de terapia?
    2. Consideram a Wii® complexa?
    3. A Wii foi utilizada como como instrumento terapêutico em que tipo pessoas?
        2.1. De que idades?
        2.2. Que características as distinguem de modo a considerarem que este método é adequado?
        2.3. Foi bem aceite?
        2.4. Que resultados obtiveram?

4. Como é que descreveriam o método tradicional? E o novo método, utilizando a Wii®?
5. Tiveram algum resultado negativo em que tivessem de regressar aos métodos tradicionais? Porquê?
6. Alguém experimentou a terapia com a Wii® e preferiu voltar aos métodos tradicionais? Porquê?
7. Pretendem continuar a investir neste tipo de terapias?
    6.1. De que forma?
    6.2.Se pudessem/surgisse a oportunidade, investiriam em outros tipos de terapias que não aquelas a que estão habituados?
8. Sentem que o factor videojogos é diferenciador relativamente à concorrência?
9. Contactaram a Nintendo para a aquisição do software ou foi a Nintendo que vos contactou?
    a. Como é/foi a relação?
    b. Há acompanhamento?
    c. Apresentam novidades?
    d. E porquê esta consola?
    e. Pensaram em algum concorrente também?
    f. Receberam outras propostas?
    g. Utilizam o *software*, mas também utilizam os jogos?
10. Sobre a implementação?
    a. Como implementaram esta inovação na clínica?
    b. Sentiram dificuldades?
    c. Foi de habituação automática?
    d. Tiveram de fazer experiências ou adaptações?
    e. Descobriram alguma oportunidade durante o processo de implementação? (algo em que ainda não tivessem pensado, mas que surgiu quando trouxeram a Wii® para a empresa?)
    f. Alguém (fisioterapeutas) rejeitou a inovação? Porquê? E sem ser por parte dos fisioterapeutas? Porquê?
    g. Cada terapeuta utiliza a Wii® de forma diferente ou têm uma espécie de protocolo a seguir? Se tiverem protocolo, está documentado? Posso obter uma cópia?
    h. Sabiam todos trabalhar com a Wii® previamente? E sabiam como adaptar a terapia ao aparelho?

Estrutura da Dissertação

1. Introdução
2. Revisão Bibliográfica
3. Apresentação dos Casos de Estudo
4. Análise, síntese, avaliação e explicação
5. Conclusões

ANEXO

Consentimento para Participação numa Entrevista de Investigação

Estudo: **Processo de Implementação dos Videojogos na Saúde**

- Esta entrevista é voluntária, pelo que tem o direito de não responder a qualquer questão e terminar a entrevista em qualquer momento por qualquer razão.
- A informação recolhida é confidencial. A sua identidade não será revelada em quaisquer relatórios ou publicações resultantes deste estudo. Não será usado o seu nome ou qualquer outra referência em concreto à sua pessoa.
- A entrevista terá de ser gravada em formato digital de forma a poder ser referenciada no processo em estudo. A sua permissão para gravar poderá ser revogada em qualquer momento.

☐ Dou permissão para esta entrevista ser gravada em formato digital.

☐ Dou permissão para ser citado em todas as informações *on the record,* desde que a informação relativa a este estudo de caso seja aprovada por mim primeiro.

☐ Dou permissão para que a informação recolhida seja publicada para fins científicos, desde que a informação relativa a este estudo de caso seja aprovada por mim primeiro.

Nome:

Assinatura_____

Data____/____/_____

Investigador_____

Data____/____/_____